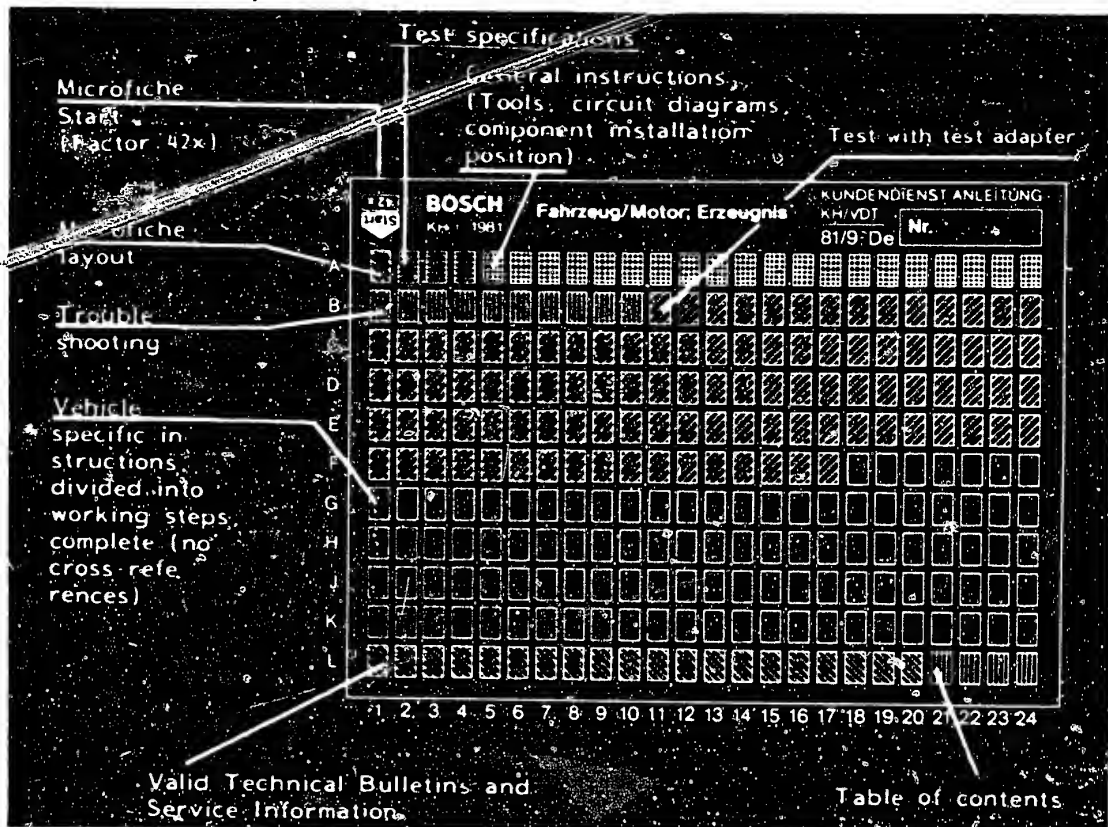


## Microfiche layout



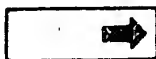
1. Read from left to right

2. Title of microfiche (appears on each coordinate)

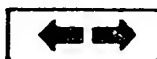
<b>E 16</b>	Product/assembly/test step	
	Vehicle/engine	

Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page  
section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

**C6**

**A1**

Trouble-Shooting Plan



## 1. Test specifications

Idle speed:

850...950 min<sup>-1</sup>

**B7**

Exhaust-gas setting:

CO concentration with  
engine at normal  
operating temperature

0.3...1.5 % by vol. CO

Fuel pressure:

2.3...2.7 bar

Fuel pump delivery

approx. 2.0 l/min

See equipment and autodata microfiches for settings for  
ignition, valve clearance and other engine data.

Solenoid-operated injection valve:

Electrical internal  
resistance

2...3  $\Omega$

Start valve:

Electrical internal  
resistance:

approx. 4  $\Omega$

**B9**

Auxiliary-air device:

Electrical internal  
resistance

approx. 49  $\Omega$

**B5**



Temperature sensor I (NTC I air):

Electrical internal resistance

at + 15°C...+30°C	1.5...3.3 k $\Omega$
at + 10°C	3.4...4.1 k $\Omega$
at + 40°C	1.0...1.2 k $\Omega$
at + 60°C	540...600 $\Omega$
at + 80°C	290...350 $\Omega$

**B7**

Temperature sensor II (NTC II coolant):

Electrical internal resistance

at + 15°C...+30°C	1.4...3.6 k $\Omega$
at + 10°C	3.0...4.5 k $\Omega$
at + 40°C	0.9...1.3 k $\Omega$
at + 60°C	480...720 $\Omega$
at + 80°C	250...390 $\Omega$

Engine-speed sensor and reference-mark sensor

Electrical internal

resistance 0.6...1.6 k $\Omega$

**B9**

Throttle-valve switch.

Resistance of idle

and full-load contacts 0  $\Omega$

**B7**

Thermo-switch

Resistance at

temperatures

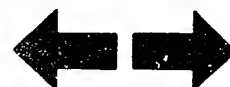
below 110°C (contact open)  $\infty$   $\Omega$   
above 120°C (contact closed) 0  $\Omega$

**B9**

**A3**

Test specifications

BMW 6 and 7 series



Thermo-time switch 35°/8 s:

**B9**

Electrical internal resistance

1. Between term. "G" and ground  
at temperatures

below + 30°C:	<u>25 ... 80 Ω</u>
above + 40°C:	<u>50 ... 80 Ω</u>

2. Between term. "W" and ground  
at temperatures

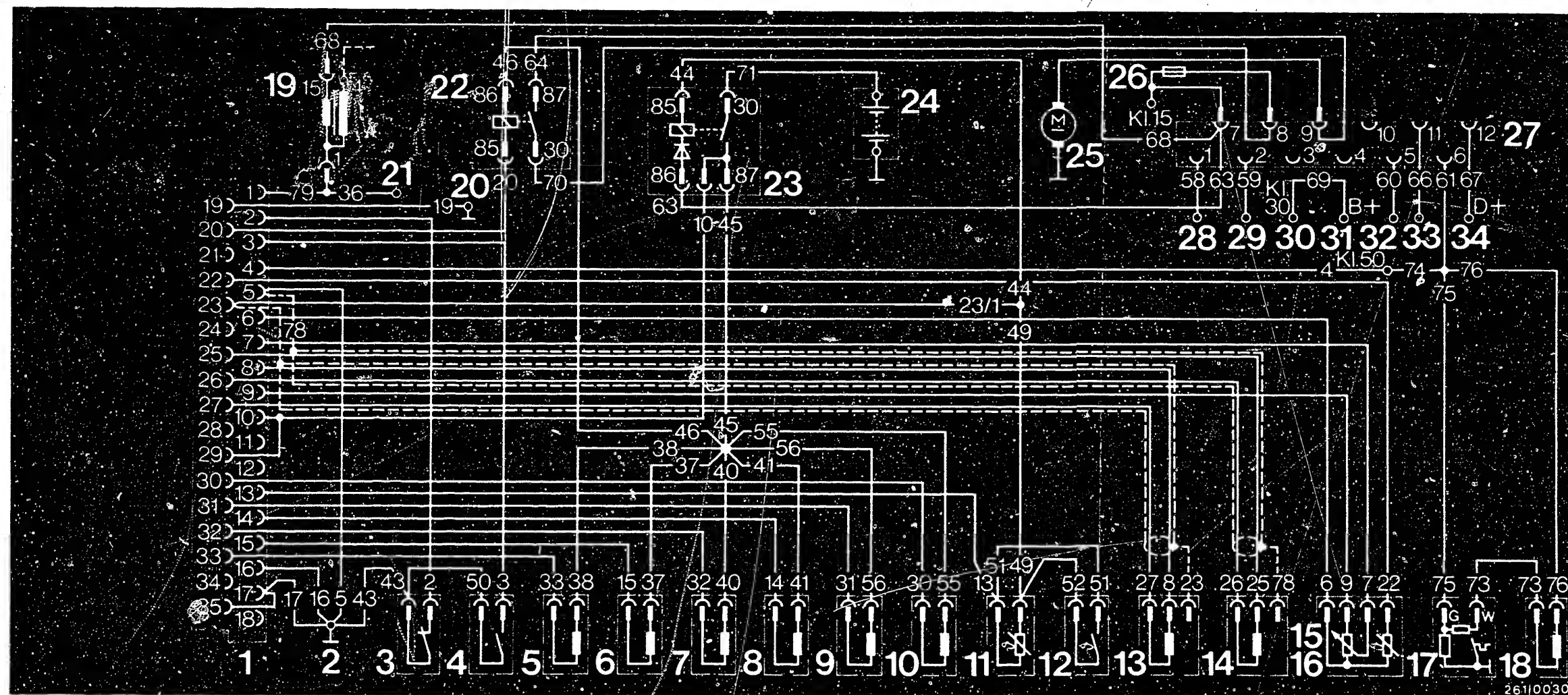
below + 30°C:	<u>0 Ω</u>
above + 40°C:	<u>100 ... 160 Ω</u>

3. Between term. "G" and "W"  
at temperatures

below + 30°C:	<u>25 ... 40 Ω</u>
above + 40°C:	<u>50 ... 80 Ω</u>







## 2. Electrical circuit diagram

### 2.1 Electrical circuit diagram up to 8.80 date of manufacture

- 1 = Multiple plug to control unit
- 2 = Vehicle ground for control unit (injection)
- 3 = Throttle-valve switch, microswitch 1 for idle
- 4 = Throttle-valve switch, microswitch 2 for full load
- 5,6,7,8,9,10 = Injection valves of cylinders 2,1,3,4,6 and 5
- 11 = Temperature sensor II (coolant)
- 12 = Thermo-switch (115°C)

- 13 = Engine-speed sensor
- 14 = Reference-mark sensor
- 15 = Air-flow sensor
- 16 = Temperature sensor I (air)
- 17 = Thermo-time switch
- 18 = Start valve
- 19 = Ignition coil
- 20 = Vehicle ground for control unit (ignition)
- 21 = To diagnostic plug and tachometer
- 22 = Relay 1 (pump relay)
- 23 = Relay 2 (main relay with reversed-polarity protection diode)

- 24 = Battery
- 25 = Fuel pump
- 26 = Pump fuse
- 27 = Engine plug
- 28 = To oil-pressure switch
- 29 = Remote thermometer sensor
- 30 = To starting motor term. 30
- 31 = To generator B+
- 32 = Oil-level switch
- 33 = Remote thermometer sensor warning contact
- 34 = Generator D+

**A5**

Electrical circuit diagram

BMW 6 and 7 series

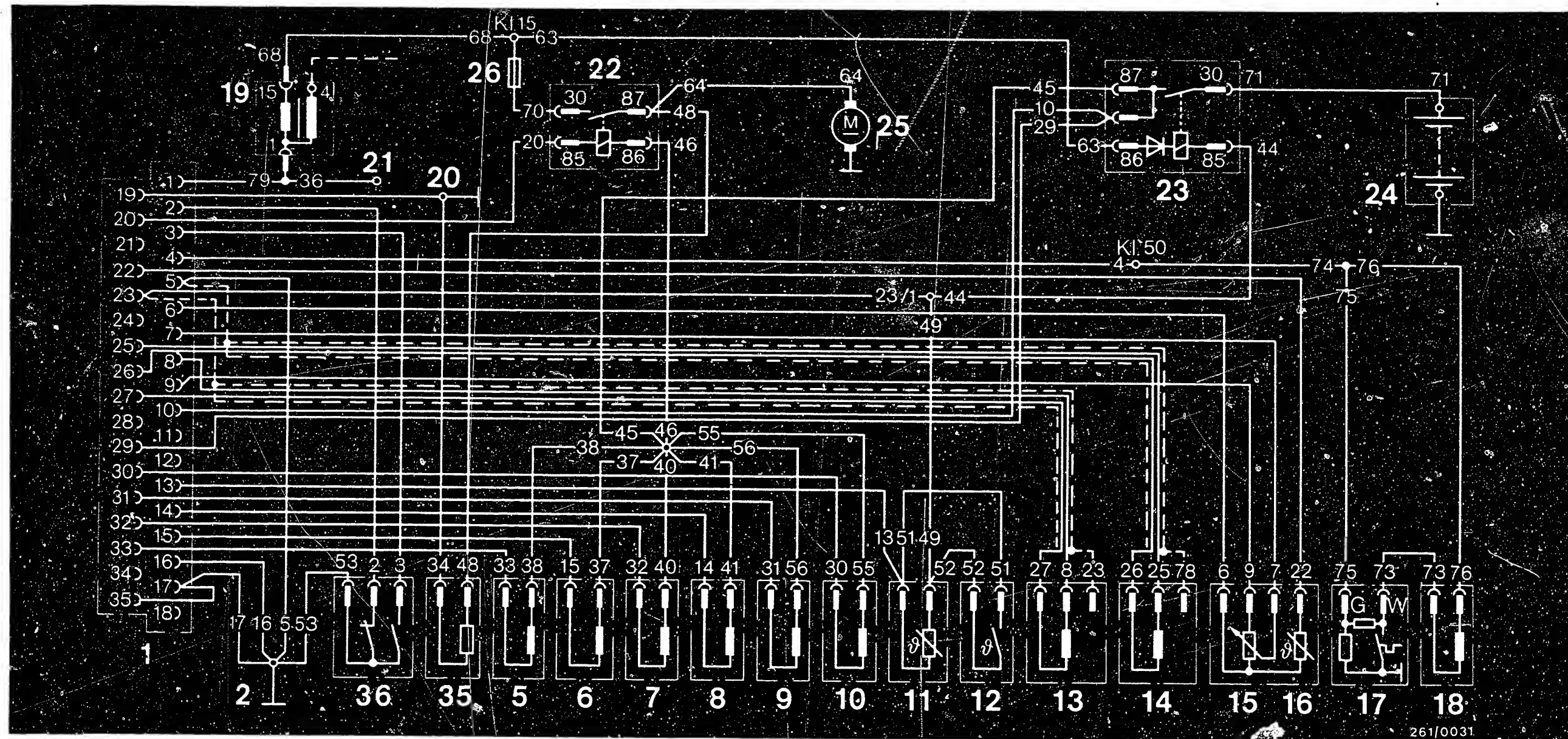


**A6**

Electrical circuit diagram

BMW 6 and 7 series





## 2.2 Electrical circuit diagram as of 8.80 date of manufacture

- 1 = Multiple plug to control unit
- 2 = Vehicle ground for control unit
- 5,6,7,8,9,10 = Injection valves of cylinders 2,1,3,4,6 and 5
- 11 = Temperature sensor II (coolant)
- 12 = Thermo-switch (115°C)
- 13 = Engine-speed sensor
- 14 = Reference-mark sensor

- 15 = Air-flow sensor
- 16 = Temperature sensor I (air)
- 17 = Thermo-time switch
- 18 = Start valve
- 19 = Ignition coil
- 20 = Vehicle ground for control unit (ignition)
- 21 = To diagnostic plug and tachometer
- 22 = Relay 1 (pump relay)

- 23 = Relay 2 (main relay with reversed-polarity protection diode)
- 24 = Battery
- 25 = Fuel pump
- 26 = Pump fuse
- 35 = Auxiliary-air device
- 36 = Throttle-valve switch with idle (term. 2) and full-load contacts (term. 3)

**A7**

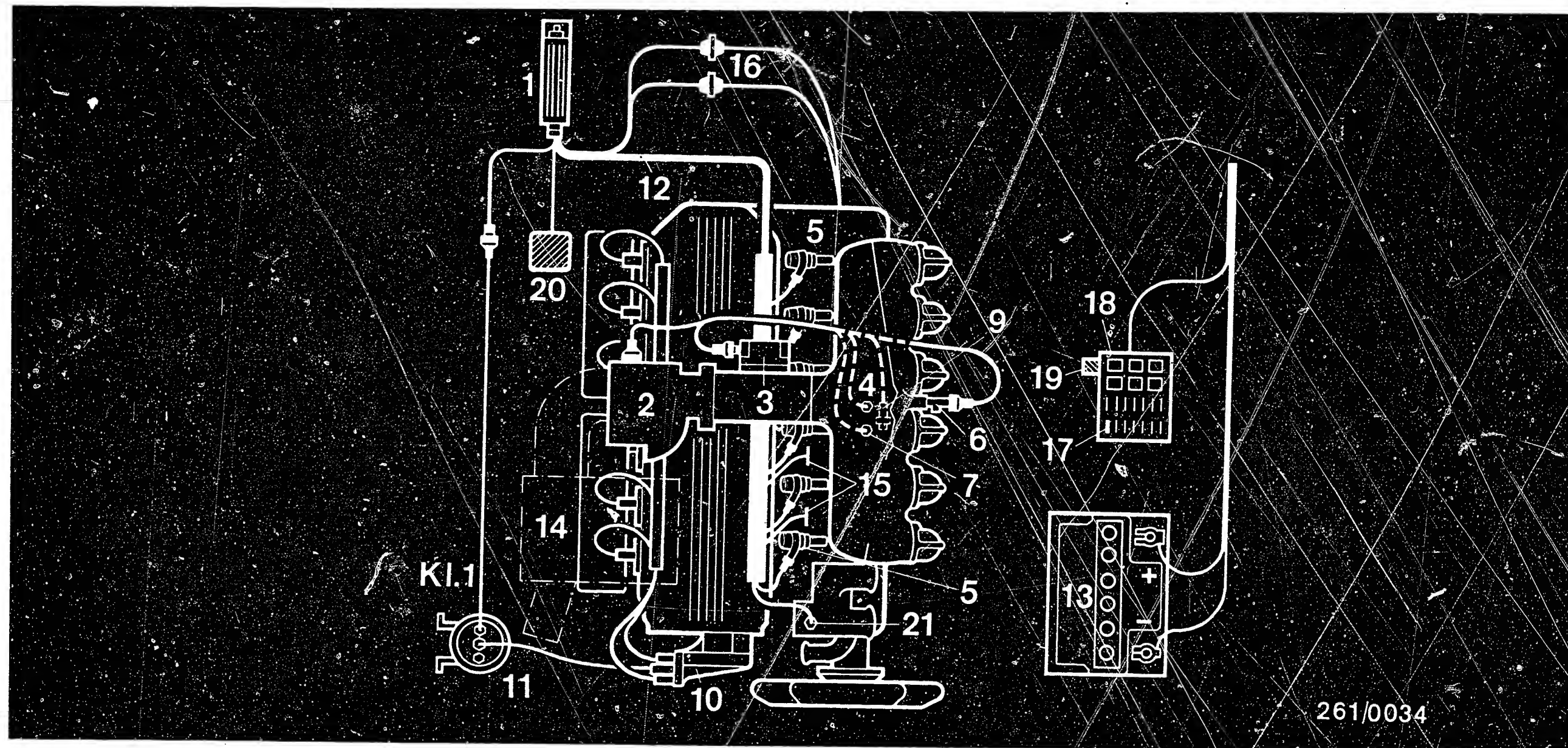
Electrical circuit diagram  
BMW 6 and 7 series



**A8**

Electrical circuit diagram  
BMW 6 and 7 series





### 3. Arrangement of Motronic components with diagram of lines

#### 3.1 Arrangement for BMW up to 8.80 date of manufacture

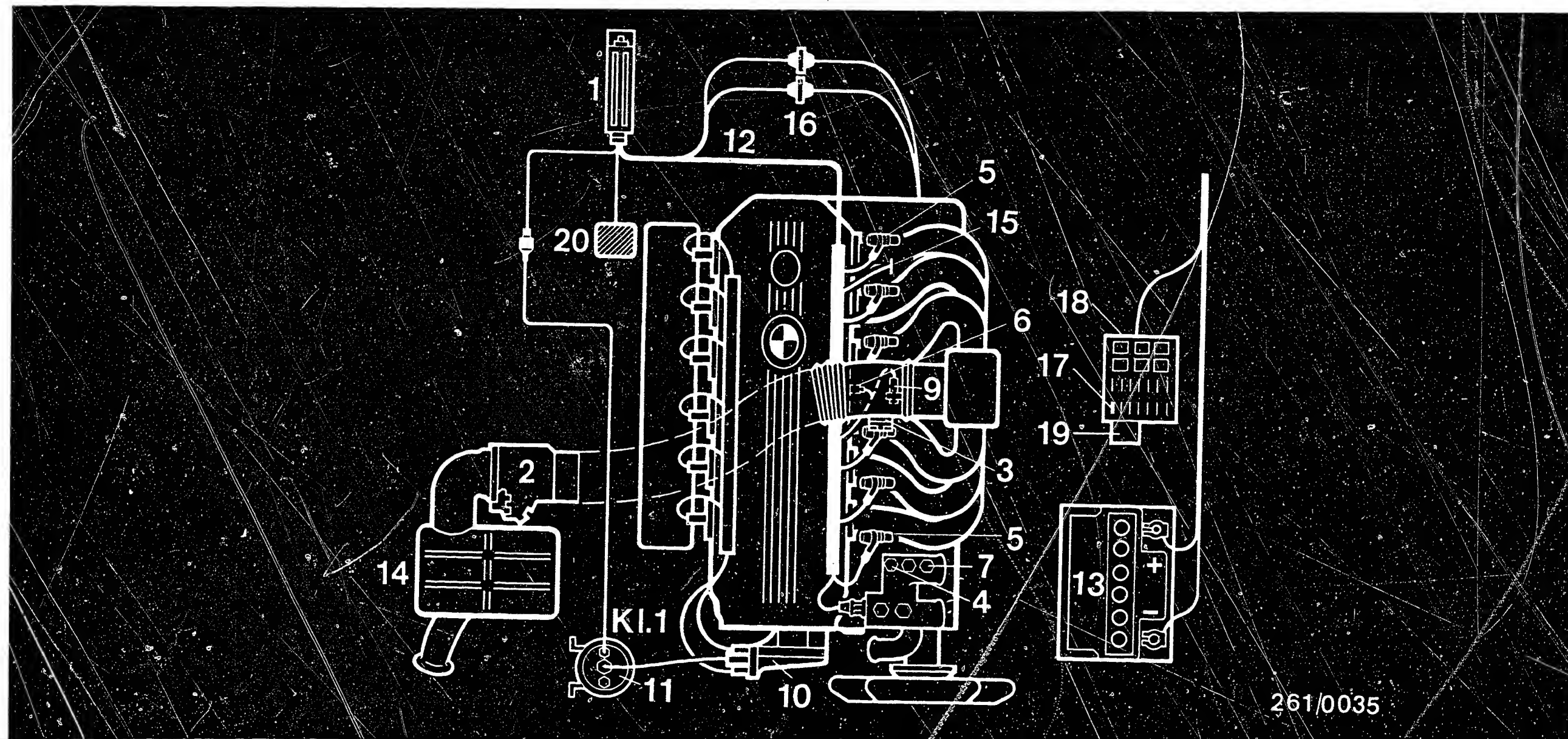
- 1 = Control unit
- 2 = Air-flow sensor
- 3 = Throttle-valve switch
- 4 = Temperature sensor
- 5 = Injection valve

- 6 = Start valve
- 7 = Thermo-time switch
- 9 = Auxiliary-air device
- 10 = High-voltage distributor
- 11 = Ignition coil
- 12 = Wiring harness
- 13 = Battery
- 14 = Air filter
- 15 = Central ground

- 16 = Plug-in connections for engine-speed and reference-mark sensors
- 17 = Pump fuse
- 18 = Electrics box
- 19 = Relay 1 for fuel pump
- 20 = Relay 2 for control unit
- 21 = Thermo-switch







### 3.2 Arrangement for BMW as of 8.80 date of manufacture

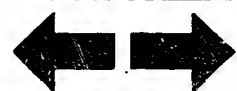
- 1 = Control unit
- 2 = Air-flow sensor
- 3 = Throttle-valve switch
- 4 = Engine temperature sensor
- 5 = Injection valve
- 6 = Start valve

- 7 = Thermo-time switch
- 9 = Auxiliary-air device
- 10 = High-voltage distributor
- 11 = Ignition coil
- 12 = Wiring harness
- 13 = Battery
- 14 = Air filter

- 15 = Central ground
- 16 = Plug-in connections for engine-speed and reference mark sensors
- 17 = Pump fuse
- 18 = Electrics box
- 19 = Relay 1 for fuel pump
- 20 = Relay 2 for control unit

**A11**

Diagram of electric lines  
BMW 6 and 7 series



**A12**

Diagram of electric lines  
BMW 6 and 7 series



261/0035

#### 4. Installation position of components

The indications "right" and "left" always refer to the forward direction of travel.

Reference-mark and engine-speed sensors:

In the starting-motor ring gear housing on the circumference of the flywheel ring gear.

Pressure regulator:

On the fuel-distribution pipe in front of the intake manifold.

Solenoid-operated injection valves:

On the intake manifold.

Start valve:

Up to 8.80 model on the intake manifold on the left-hand side. As of 8.80 model on the intake manifold under the throttle-valve assembly.

High-voltage distributor:

Between intake manifold and radiator fan.

Fuel filter and fuel pump:

Underneath the vehicle on the left-hand side, near the fuel tank.

Air-flow sensor:

Between air filter and intake manifold

Relay 1 (fuel pump relay):

On the fuse box

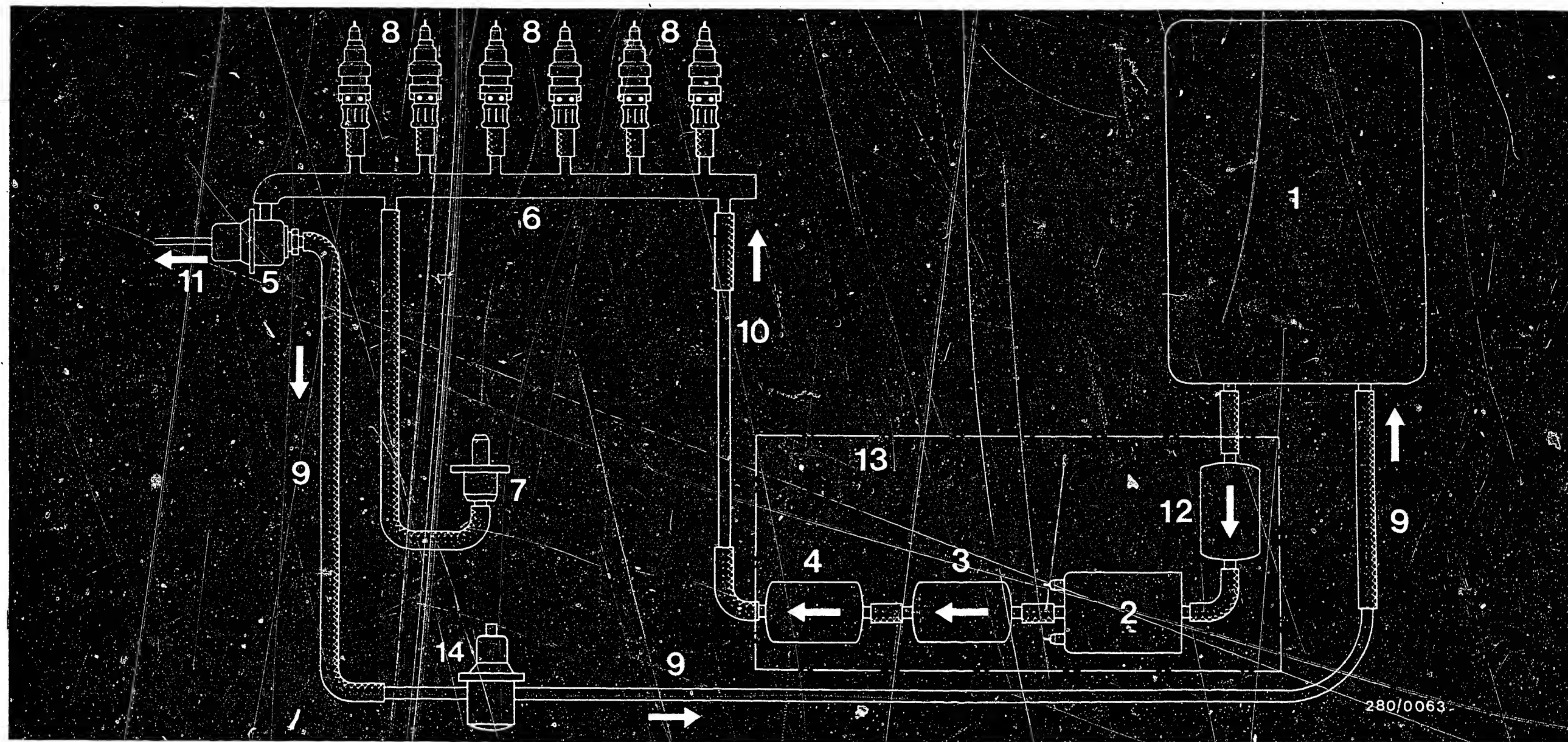
Relay 2 (main relay):

In the engine compartment on the right-hand side on the firewall.



Control unit:	7 series: Behind the side panelling in the right-hand footwell 6 series: In the glove compartment.
Temperature sensor I:	In the air-flow sensor
Temperature sensor II (engine):	Up to 8.80 model between 3rd and 4th ram pipes. As of 8.80 model in front of the intake manifold, near fan.
Thermo-switch:	In front of the intake manifold, near fan.
Thermo-time switch:	Up to 8.80 model between 3rd and 4th ram pipes. As of 8.80 model in front of the intake manifold, near fan.
Central ground:	Up to 8.80 model on intake-manifold mounting at front right. As of 8.80 model below the plug-in connections for engine-speed and reference-mark sensors.
Auxiliary-air device:	Up to 8.80 model between 3rd and 4th ram pipes. As of 8.80 model underneath the throttle-valve assembly.





# 5. Diagram of fuel lines

- 1 = Fuel tank
- 2 = Electric fuel pump (tube-type pump)
- 3 = Expansion vessel
- 4 = Fuel filter
- 5 = Pressure regulator
- 6 = Fuel-distribution pipe

- 7 = Start valve
  - 8 = Solenoid-operated injection valves
  - 9 = Fuel return line
  - 10 = Fuel delivery line
- Delivery line and return line are routed on the left-hand side under the floor panel to the fuel tank.

- 11 = To intake manifold
- 12 = Fuel spinner
- 13 = Mounting plate
- 14 = Fuel-line-pressure damper (in all vehicles as of 10.80)

**A15**

Diagram of fuel lines

BMW 6 and 7 series



**A16**

Diagram of fuel lines

BMW 6 and 7 series



## 6. Test equipment and tools

<u>Description</u>	<u>Designation</u>	<u>Part No.</u>
Motronic test adapter	ETT 018:00	0 684 101 800
Motortester	e.g. MOT 002.00 or 200	0 684 000 200
Exhaust-gas analyzer	e.g. ETT 008.02 or ETT 008.03	0 684 100 802 0 684 100 803
Multimeter (analog reading, internal resistance min. 20 k $\Omega$ /V)		Commercially available e.g. Master 50 K from Mislco Co. or Chinaglia, Cortina model
Pressure gauge 6 bar  or Pressure tester or Pressure tester (no longer available)  Three-way line as connection piece for KDJE-P100 and KDEP 1034	Quality class 1.0 0.1 bar graduations	1 687 231 154  KDJE-P 100  KDEP 1034  KDJE-P100/13





<u>Description</u>	<u>Part No.</u>
Feeler gauge for measuring the sensor air gaps (up to 1 mm)	Commercially available
Lubricant for engine-speed and reference- mark sensors	Molykote Longterm 2, commercially available
Chassis dynamometer e.g. LPS 96 or LPS 002	0 680 017 001 0 680 100 200
Electric connecting cable (test lead) for direct connection of the components under test, e.g. thermo-time switch	KDJE 7450/70



## 7. Important general information

This information must be observed in order to prevent damage to the engine, control unit or ignition coil and for the safety of personnel.

7.1 Never start engine without securely connected battery.

7.2 Incorrect polarity of the supply voltage, e.g. by incorrect connection of the battery or ignition coil, can lead to irreparable damage to the control unit.

7.3 Do not use a fast charger for starting the engine.

Use only a second 12 V battery and jump leads.

Caution! Owing to different requirements of vehicle manufacturers with regard to electronic products we advise you not to use 24 V batteries as an aid for starting. Follow the vehicle owners manual.

7.4 Disconnect the battery from the vehicle electrical system before fast charging.



7.5 When charging the battery in the vehicle or when using a starting aid, follow the information in the operating instructions of the fast charger and also follow the information given by the vehicle manufacturer.

7.6 Never disconnect the battery from the vehicle electrical system with the engine running.

7.7 Do not short-circuit ignition coil term. 1 to ground (e.g. for stopping the engine). The ignition coil and possibly the control unit will suffer irreparable damage.

7.8 Never bring the positive pole of the battery into contact with ignition coil term. 1. The control unit will suffer irreparable damage.

7.9 Never connect or disconnect the wiring-harness plug of the control unit with the ignition switched on.

7.10 Remove the control unit at temperatures above 80°C (paint-drying installation).

7.11 Remove the control unit before performing welding work (electric spot welding).

7.12 Remove the main relay when performing a compression test. This prevents undesired injecting of the injection valves.

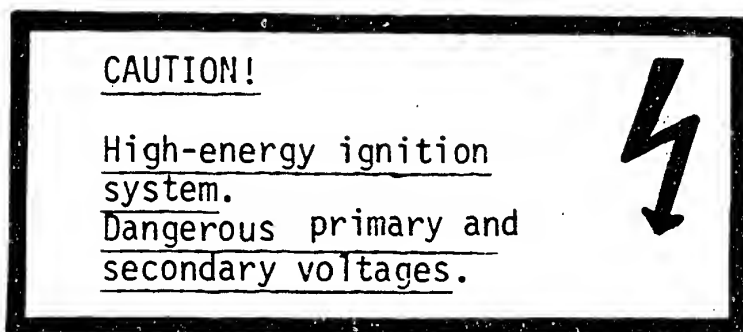


7.13 When installing an alarm system, follow the information given in the installation instructions for Motronic vehicles or follow technical bulletin "New Product" VDT-I-335/5.

The vehicle manufacturer recommends lead 44 to the main relay or the ground lead to the pump relay.

It must be ensured that the alarm relay does not suffer interference from stray fields (e.g. from H.T. ignition cables), causing it to trip incorrectly.

7.14



The above sticker has the following meaning:

The Motronic contains a high-performance ignition system which can be dangerous if live parts or terminals are touched (both on the primary as well as secondary sides).



In this connection we should like to point out that the VDE regulations, particularly VDE 0104/7.67, must be observed when testing or working on the ignition system.

The ignition must always be switched off when working on the ignition coil (switch off ignition/voltage source). Such work includes:

- Connection of engine testers (timing light, dwell-tach tester, ignition oscilloscope etc).
- Replacement of parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc).

If, when testing the ignition system or when performing adjustments on the engine (e.g. carburettor), it is necessary to switch on the ignition (switch on ignition/voltage source), the above-mentioned dangerous voltages occur over the entire system.

There is, therefore, danger of accident not only on the individual components of the ignition system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), on plug-in connections and on testers.



## 8. Trouble-shooting

The following trouble-shooting programs are designed to enable the workshop employees using the Motronic test adapter and other suitable testers to quickly detect causes of trouble on the Motronic.

Depending on the level of training and experience of the mechanic a choice can be made between the following procedures:

- Detailed, step-by-step trouble-shooting for employees with little experience or practice on Motronic vehicles.
- Pin-pointed direct trouble-shooting for trained and experienced employees who have a great deal of practice on Motronic vehicles.

Both trouble-shooting programs start by checking the electrical/electronic part of the Motronic using the Motronic test adapter ETT 018.00. This makes it possible within a short space of time to check the electrical operation of the wiring harness with the connected components (including control unit) and to quickly locate faults.

If no fault is found using the Motronic test adapter, it is necessary to continue with the detailed or the direct trouble-shooting program.

**B3****B5****B1**

Trouble-shooting  
BMW 6 and 7 series

**B2**

Trouble-shooting  
BMW 6 and 7 series



## 8.1 Detailed, step-by-step trouble-shooting

### 8.1.1 Test with Motronic test adapter

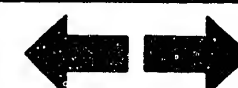
This test must come at the start of the test program and must be performed from beginning to end.

### 8.1.2 Trouble-shooting according to customer complaints (fault symptoms)

The table below contains possible fault symptoms and the right-hand column gives the first coordinate of the respective detailed trouble-shooting program.

The trouble-shooting program consists of logically ordered test steps for all individual components of the Motronic. If, after completing the trouble-shooting program for an assumed symptom, the fault has not been located or remedied, choose a new fault symptom and work through the respective program.

<u>Customer complaints (fault symptom)</u>	<u>Test with test adapter</u>	<u>Coordinates</u>
1. Engine fails to start or starts only with great difficulty	B 11	F18 - G10
2. Engine starts but then dies	B 11	G11 - G24
3. Uneven engine idle	B 11	H 1 - H14
4. Poor throttle take-up	B 11	H15 - H24
5. Engine missing under all operating conditions	B 11	J 1 - J12
6. Fuel consumption too high	B 11	J13 - J18
7. No maximum engine power	B 11	K 1 - K12
8. CO concentration at idle too high or too low	B 11	K13 - K22



## 8.2 Pin-pointed, direct trouble-shooting

### 8.2.1 Test with Motronic test adapter

The test with the test adapter must come at the start of the test program and must be performed from beginning to end.

### 8.2.2 Trouble-shooting according to customer complaints

The table below contains various fault symptoms with several possible causes of the fault in each case. The references given on the left indicate the first coordinate of the test step for the respective individual component of the Motronic. If, after testing the individual components, the fault has not been located or remedied, it is necessary to choose a new fault symptom.

#### Customer complaint (fault symptoms)

1. Engine fails to start or starts only with great difficulty								
2. Engine starts but then dies								
3. Uneven engine idle, idle speed incorrect								
4. Poor throttle take-up								
5. Engine missing under all operating conditions								
6. Fuel consumption too high								
7. No maximum engine power								
8. CO concentration at idle too high or too low								
Cause (component fault)								
B11	B11	B11	B11	B11	B11	B11	B11	Test with Motronic test adapter
● *)								Pump relay defective
● *)								Electric fuel pump not operating
G 3	G21		H21					Auxiliary-air device not opening
		H 7						Auxiliary-air device not closing
	G19	H 3	H19	J 9	J17	K 7	K15	Air-flow sensor defective

Continued on B7/B8/B9/B10





# Customer complaints (fault symptoms)

1. Engine fails to start or starts only with great difficulty

2. Engine starts but then dies

3. Uneven engine idle, idle speed incorrect

4. Poor throttle take-up

5. Engine missing under all operating conditions

6. Fuel consumption too high

7. No maximum engine power

8. CO concentration at idle too high or too low

Cause (component fault)

● *)								Main relay
G 7	G13	H 5	H19				K17	Air-intake system leaking
F20		H13						Solenoid-operated injection valves defective
● *)		● *)				K 5		Fuel pressure too low or zero; pressure regulator not operating
		● *)			● *)		● *)	Fuel pressure too high; pressure regulator not operating
				J 7		K 9		Fuel delivery too low
	● *)				● *)		● *)	Temperature sensor I (air) or temperature sensor II (coolant) defective
		H13						Throttle valve not closing
						K 3		Throttle valve not opening fully
				J 3				Poor central ground, loose contacts, faulty plug-in connections
G 7	G13	H 5	H19	J 3		K11	K17	Open circuit in wiring harness and plug-in connections
		● *)				● *)		Throttle-valve switch defective
		H13					K21	CO exhaust-gas setting too rich, idle adjustment
		H13	● *)				K21	CO exhaust-gas setting too lean, idle adjustment
F22								Start valve not opening

Continued on B9/B10

**B 7**

Trouble-shooting  
BMW 6 and 7 series



**B 8**

Trouble-shooting  
BMW 6 and 7 series



# Customer complaints (fault symptoms)

1. Engine fails to start or starts only with great difficulty
  2. Engine starts but then dies
  3. Uneven engine idle, idle speed incorrect
  4. Poor throttle take-up
  5. Engine missing under all operating conditions
  6. Fuel consumption too high
  7. No maximum engine power
  8. CO concentration at idle too high or too low
- Cause (component fault)

	G17	H11		J 5	J15		K19	Start valve not closing
F20	G15							Thermo-time switch defective
●*)								Engine-speed sensor defective
●*)								Reference-mark sensor defective
		H 3		J 3		K 3		High-voltage distributor oil-fouled
		●*)						Thermo-switch defective
●*)	●*)	●*)	●*)	J 7	●*)	●*)	●*)	Control unit defective

●\*) If you have performed the test with the Motronic test adapter, this component has already been tested. Continue testing with the next component in this column.  
 However, if you have arrived at this point through a component complaint or through the test-specifications table, you must test this component with the Motronic test adapter. The test program for the test adapter begins on Coordinate B11 and must be performed from beginning to end.



## 9. Test with Motronic test adapter ETT 018.00

(0 684 101 800)

Connect the Motronic test adapter to the Motronic wiring harness (ignition must be off).

For testing the wiring harness and the connected components, only the Motronic wiring harness must be connected - but not the control unit. Be sure to observe the instructions in the test chart!

A pointer instrument for the voltage and resistance measurements (multimeter) as well as the motortester must be connected to the test adapter in order to make the measurements.

The individual test steps are selected with the program selector switch. The symbols V,  $\Omega$  and MOT show the operator which measuring instrument must be used. If the program selector switch position number has a circle around it, this means that further test steps follow by pressing a push-button. By pressing the push-buttons it is possible, with the control unit connected and the engine running, to simulate given operating conditions. Thus, for example, with the engine at normal operating temperature it is possible by pressing the grey push-button NTC II to make the control unit "think" that the engine temperature is  $-20^{\circ}\text{C}$ . It is then possible to evaluate the reaction of the control unit on the motortester.

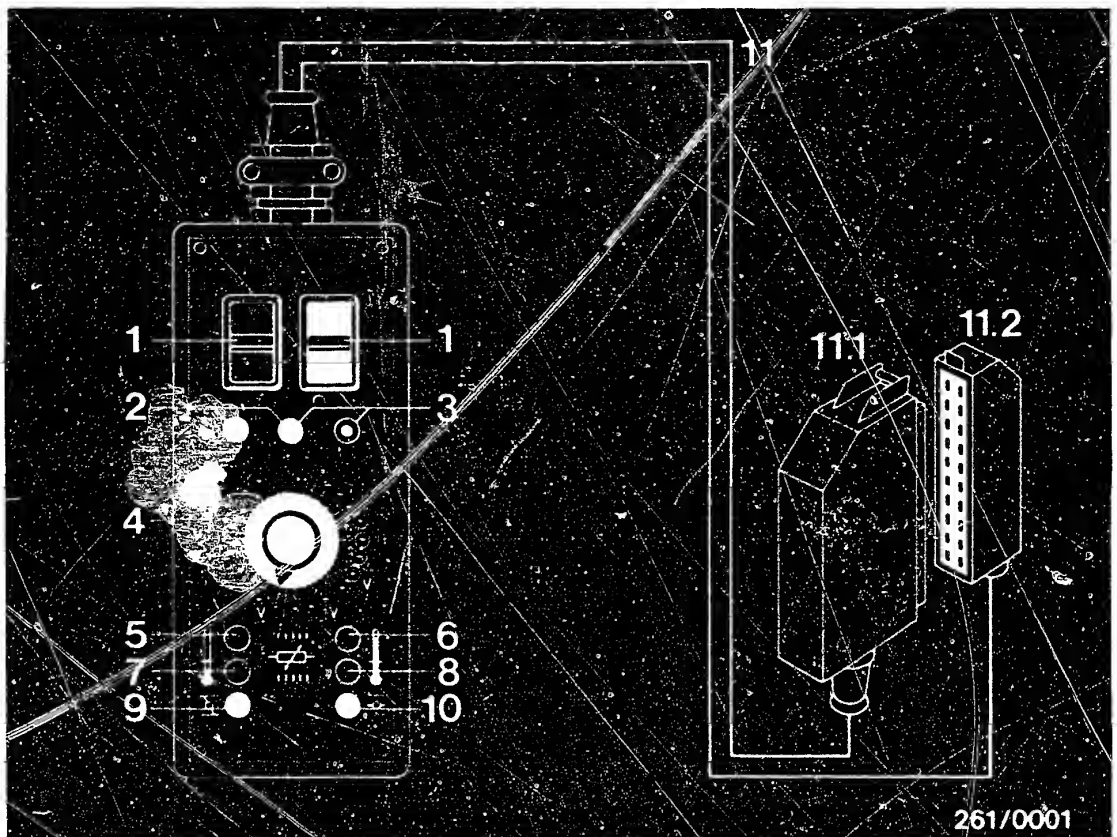
If necessary, the circuit diagram can be used for trouble-shooting.

**B11**

Test with test adapter

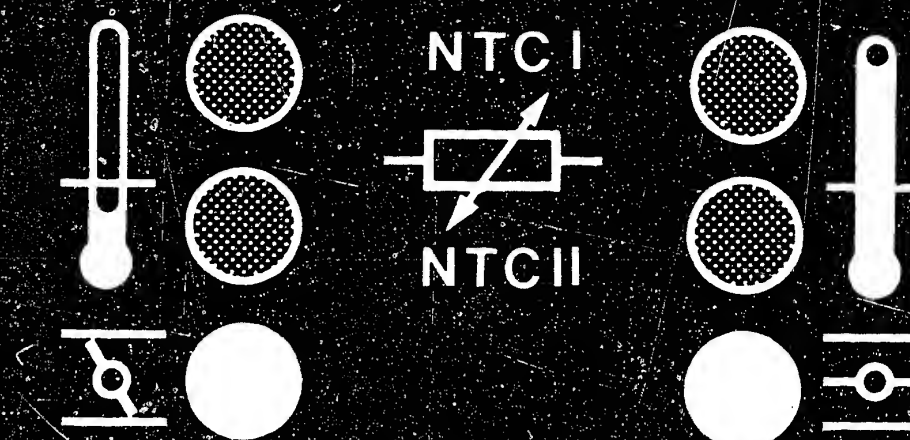
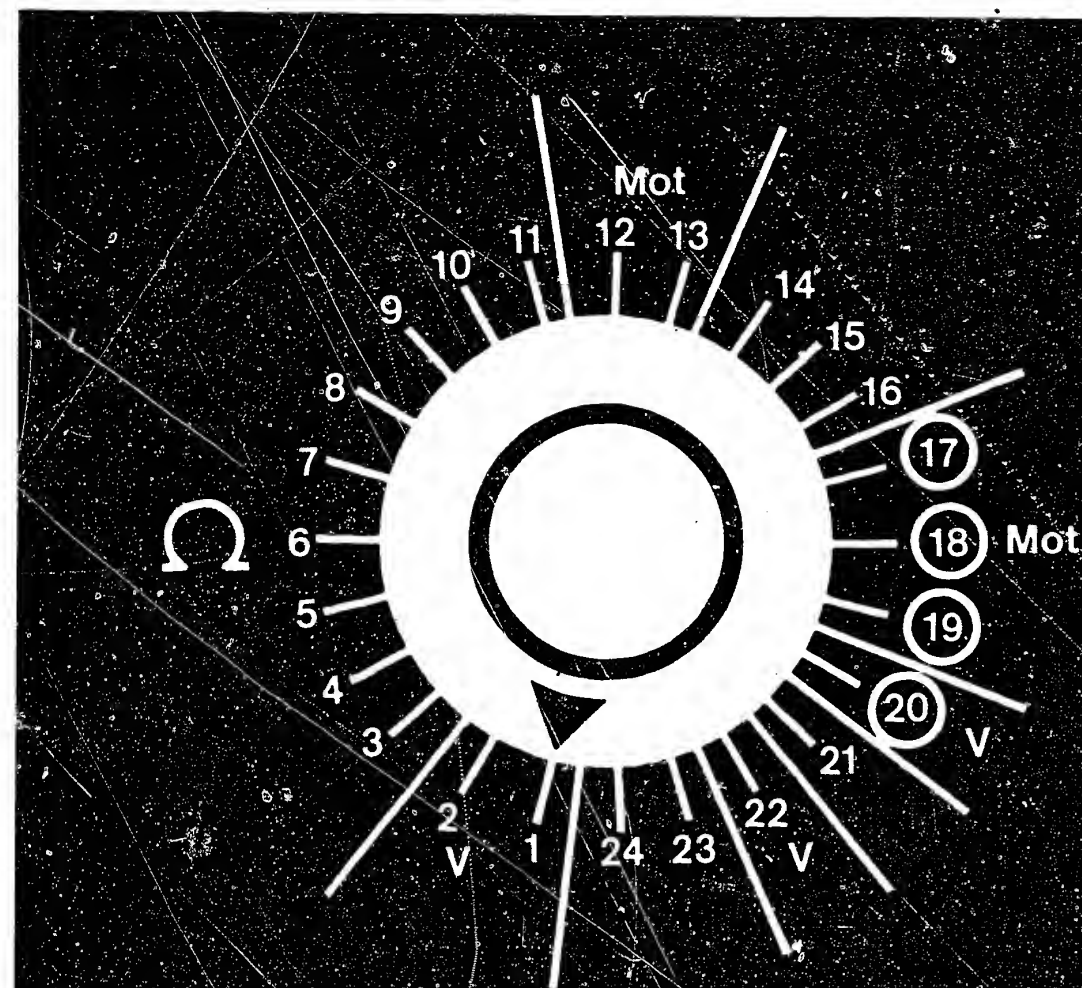
BMW 6 and 7 series





### 9.1 Construction

1. Connection terminals (test wells) for ignition oscilloscope
2. Connection sockets for voltmeter
3. Connection sockets for ohmmeter
4. Program selector switch with 24 program steps
5. Push-button for air temperature  $-20^{\circ}\text{C}$  (NTC I)
6. Push-button for air temperature  $+80^{\circ}\text{C}$  (NTC I)
7. Push-button for engine temperature  $-20^{\circ}\text{C}$  (NTC II)
8. Push-button for engine temperature  $+80^{\circ}\text{C}$  (NTC II)
9. Push-button for throttle-valve switch, idle contact
10. Push-button for throttle-valve switch, full-load contact
11. Connection cables
  - 11.1 Connection to wiring harness
  - 11.2 Connection to control unit




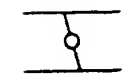
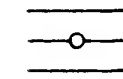


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## 9.2 Symbols on test adapter

### Program selector switch:

- V** Means: Test steps with voltage measurement
- Ω** Means: Test steps with resistance measurement
- MOT** Means: Test steps with motortester
- Means: Additional test steps by pressing push-button

### Push-buttons (for simulating operating conditions)

-  Temperature sensor symbol
- NTC I** Air temperature sensor
- NTC II** Water temperature sensor
-  Throttle valve closed (idle contact closed)
-  Throttle valve open (full-load contact closed)
-  Symbol for low temperature (-20°C simulated in adapter)
-  Symbol for high temperature (+60°C simulated in adapter)

**B 13**

Test with test adapter  
BMW 6 and 7 series

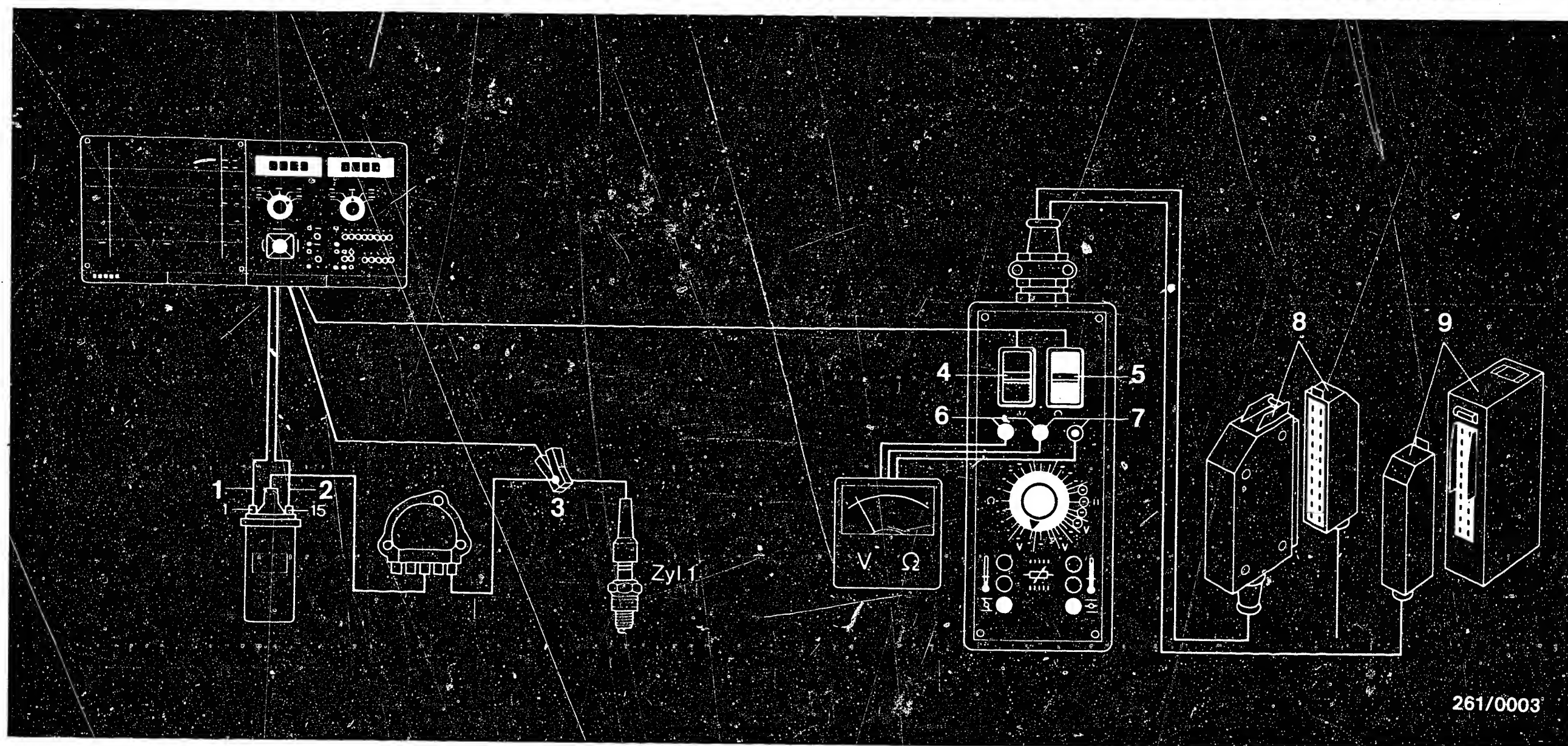


**B 14**

Test with test adapter  
BMW 6 and 7 series







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### 9.3 Connection diagram for test adapter

- 1 = Green clip to ignition coil term. 1
- 2 = Yellow clip to ignition coil term. 15
- 3 = Induction-type clamp-on pickup over H.T. ignition cable of cylinder 1
- 4 = Red connection socket (test well) for red terminal of motortester
- 5 = Black connection socket (test well) for black terminal of motortester

- 6 = Connection of voltmeter to red (+) and black (-) sockets
- 7 = Connection of ohmmeter to black and blue sockets
- 8 = Connection to Motronic wiring harness
- 9 = Connection to Motronic control unit
- 10 = Motortester

**B15**

Test with test adapter  
BMW 6 and 7 series



**B16**

Test with test adapter  
BMW 6 and 7 series



## Preparations for test with test adapter

### 1. Remove the control unit and connect the test adapter.

Installation position in 7 series: Behind the side panelling on the right-hand side in the front passenger footwell. The L-Jetronic control unit was previously accommodated here.

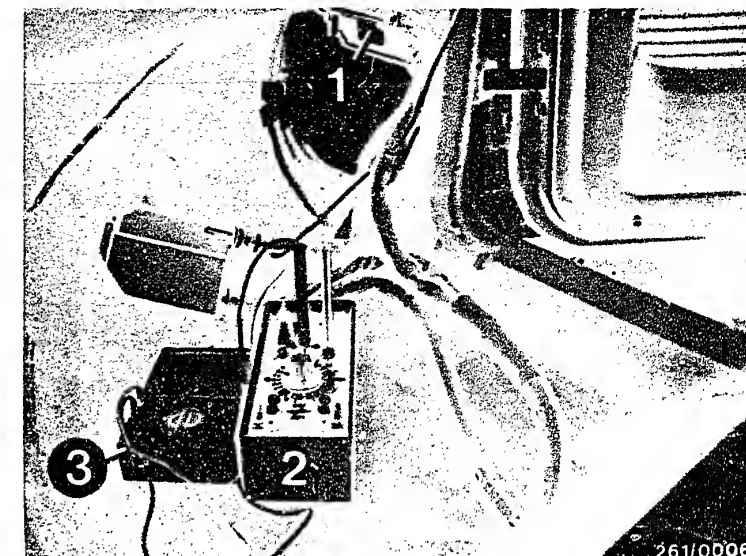
Installation position in 6 series: In the glove compartment. The L-Jetronic control unit was previously accommodated here.

To remove the control unit, force back the detent and hinge up and remove the plug in the direction of the arrow.

The control unit is secured by 2 screws.

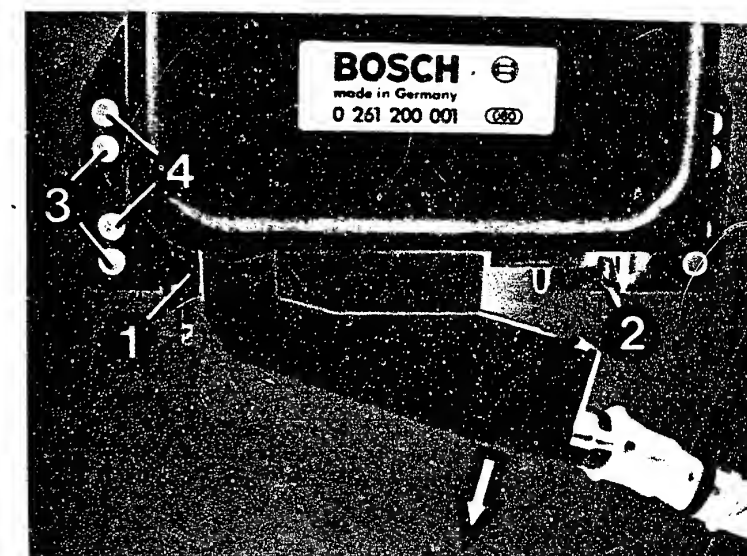
### Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Control unit
- 2 = Test adapter
- 3 = Multimeter

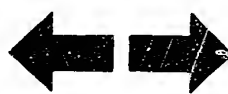
- 1 = Locating lug
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series



**B17**

Test with test adapter

BMW 6 and 7 series



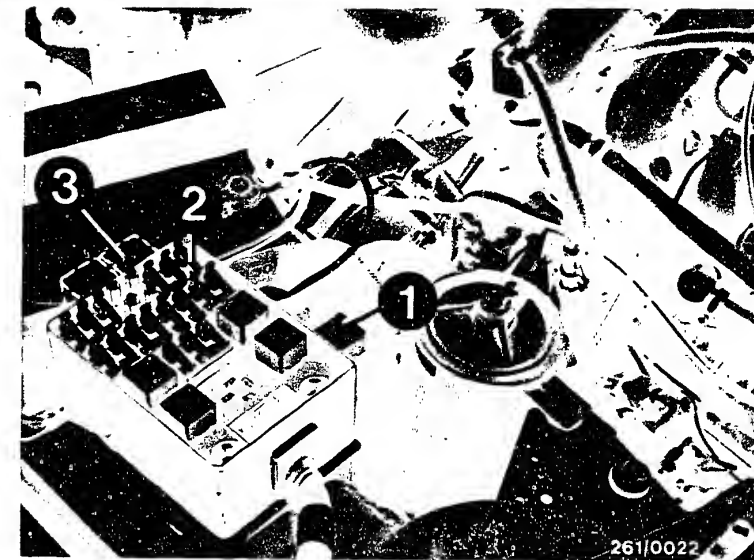
**B18**

Test with test adapter

BMW 6 and 7 series



## 2. Remove pump relay 1



- 1 = Installation position of pump relay up to 8.80
- 2 = Pump fuse
- 3 = Installation position of pump relay as of 8.80

### Note:

In the following test steps a black border in the "Operation" column shows which operation has to be changed compared with the preceding test step.

**B19**

Test with test adapter  
BMW 6 and 7 series

**B20**

Test with test adapter  
BMW 6 and 7 series

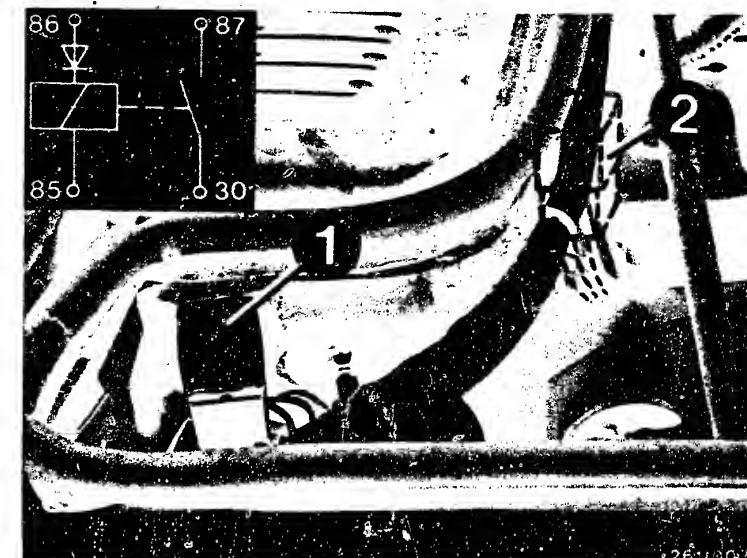




<u>Test step 1</u>		<u>Reading</u>	<u>Testing</u>
<u>Operation</u>			
Program selector switch position	1		Component: Relay 2 Installation position: on right-hand side in engine compartment on firewall
Measuring instrument: Voltmeter			
Measuring range:	15 V		
Test sockets (red = + black = ground)	V		Operation: Supply voltage 1 for control unit at terminals 10 (+) and 5 (ground)
Control unit and pump relay 1 not plugged in		Malfunction: Voltage less than 10 V	
<u>Operation in vehicle:</u> Switch on ignition			

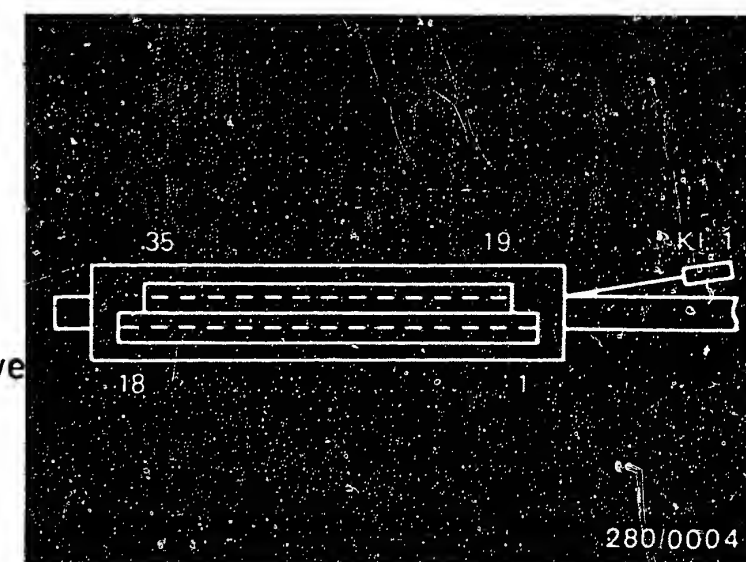
#### Trouble-shooting:

1. Voltage less than 10 V: Battery insufficiently charged or high voltage drops across the terminals.
  2. No voltage reading: Check relay 2.  
Perform the following voltage measurements at relay 2 with the ignition switched on:
    - Measure battery voltage at term. 87 (2x), term. 86 and term. 30. Measure ground connection term. 85 to B+ (test adapter connected).
    - Check lead 10 from relay 2 term. 87 to control unit term. 10.
    - Check Motronic ground terminal on intake-manifold mounting; also lead 5.
  3. If voltage is greater than 15 V: Generator regulator defective.
- Note: When replacing relay 2 make sure only to install a relay with a blocking diode. Observe symbol on relay housing.



- 1 = Installation position of relay 2 up to 8.80  
2 = Installation position of relay 2 as of 8.80

Top view of 35-pin multiple plug of Motronic wiring harness.  
K1: 1 (term. 1) = Plug-in connection to tachometer and to diagnostic socket



**C1**

Test with test adapter  
BMW 6 and 7 series

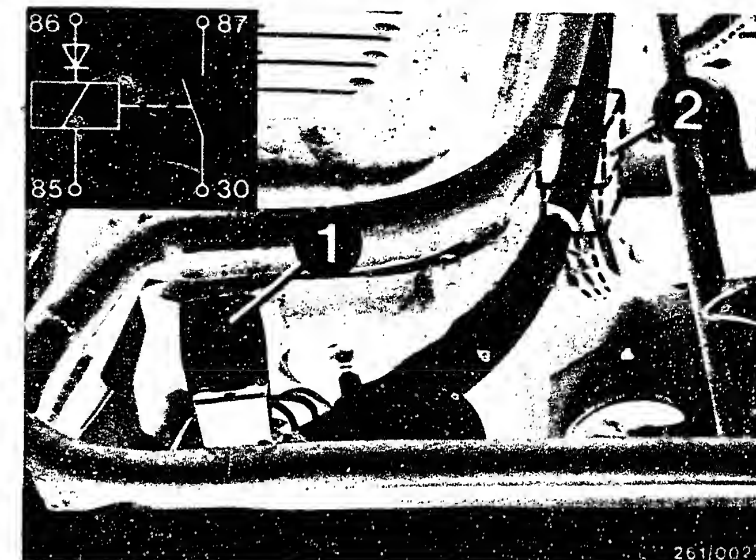


**C2**

Test with test adapter  
BMW 6 and 7 series

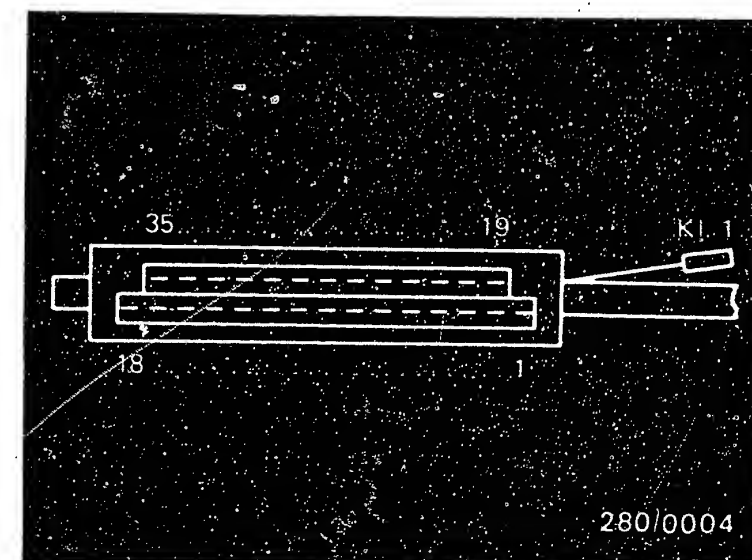


Test step 2		Reading	Testing
Operation			
Program selector switch position	2	10 ... 15 V	Component: Relay 2 Installation position: on right-hand side in engine compartment on firewall.
Measuring instrument: Voltmeter			
Measuring range:	15 V		
Test sockets (red = + black = ground)	V		
Control unit and pump relay 1 not plugged in			
Operation in vehicle: Switch on ignition			
			Operation: Supply voltage 2 for control unit at terminals 29 (+) and 5 (ground)
			Malfunction: Voltage less than 10 V



- 1 = Installation position of relay 2 up to 8.80  
2 = Installation position of relay 2 as of 8.80

Top view of 35-pin multiple plug of Motronic wiring harness  
K1. 1 (Term. 1) = Plug-in connection to tachometer and to diagnostic socket



#### Trouble-shooting

1. Voltage less than 10 V: Battery insufficiently charged or high voltage drops across the terminals.
2. No voltage reading: Relay 2 defective; check lead 29 from relay 2 term. 87 to control unit term. 29.

Note: When replacing relay 2 make sure only to install a relay with blocking diode. Observe symbol on relay housing.

**C3**

Test with test adapter  
BMW 6 and 7 series



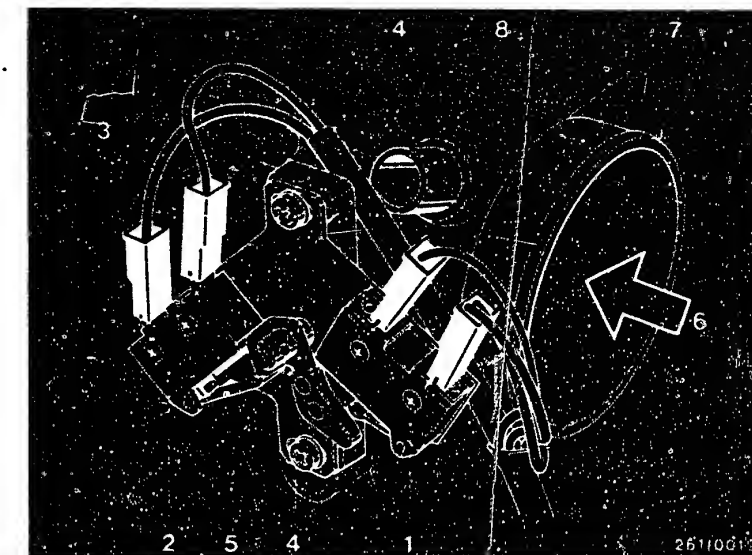
**C4**

Test with test adapter  
BMW 6 and 7 series



Test step 3		Reading		Testing
Operation				
Program selector switch position	3	Accelerator in rest position:		Component: Throttle-valve switch Installation position: Directly on throttle shaft
Measuring instrument: Ohmmeter		Less than 15 Ω		
Measuring range: 0 to 10 kΩ		(Measured value is influenced by protective resistor in adapter).		Operation: Idle contact between terminal 2 and ground
Test sockets (blue and black)	Ω	Accelerator depressed (Part-load range):		
Control unit and pump relay 1 not plugged in		∞ Ω 1)		Malfunction: Resistance greater than 15 Ω
Operation in vehicle: Ignition off				

Test specifications reached?	No	<p><u>Trouble-shooting:</u> 1) <u>Adjusting the throttle-valve switch:</u></p> <p>Loosen the fastening screws. Turn the operating lever to full throttle and slowly return to the idle stop. Turn the switch in a clockwise direction until the reading is less than 15 <math>\Omega</math> (idle contact closes) or, in the case of a BOSCH throttle-valve switch, until the inner stop can be felt. Tighten screws.</p>
------------------------------	----	---



Design of throttle-valve switch up to 8.1980 date of manufacture

- 1 = Microswitch 1 for idle
- 2 = Microswitch 2 for full load
- 3 = Carrier plate for microswitches 1 and 2
- 4 = Fastening screws for carrier plate
- 5 = Operating lever
- 6 = Direction of air
- 7 = Throttle-valve assembly
- 8 = Fitting for air hose to start valve

Yes

Continued on C7/C8

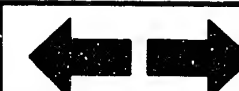
**C5**

Test with test adapter  
BMW 6 and 7 series



**C6**

Test with test adapter  
BMW 6 and 7 series



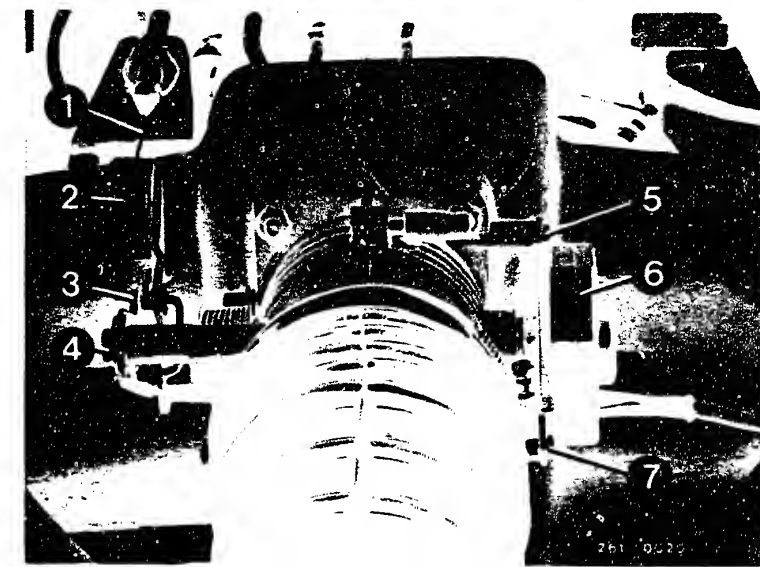
Trouble-shooting - throttle-valve switch  
(continued)

Check: Slowly open throttle in full-load direction. Reading must change to  $\infty \Omega$  shortly after the throttle is opened.

If no adjustment is possible:

In vehicles up to 8.1980 date of manufacture:  
Check microswitch for idle as well as leads 2, 43 and 50.

In vehicles as of 8.1980 date of manufacture:  
Check Bosch throttle-valve switch as well as leads 2 and 53 (ground).



- 1 = Throttle cable in full-load position
- 2 = Throttle-valve stop bracket
- 3 = Idle stop for throttle valve
- 4 = Fastening screw for idle stop
- 5 and 7 = Fastening screws for throttle-valve switch
- 6 = Throttle-valve switch

Yes

Continued on C9/C10

**C7**

Test with test adapter  
BMW 6 and 7 series

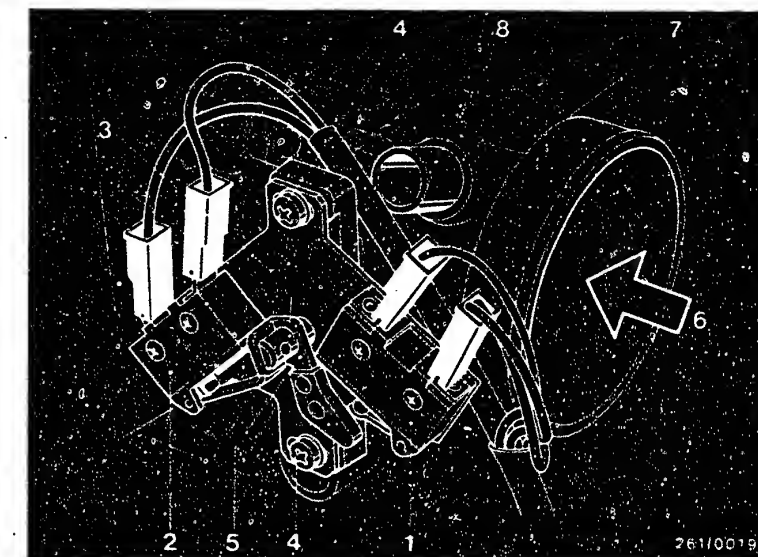
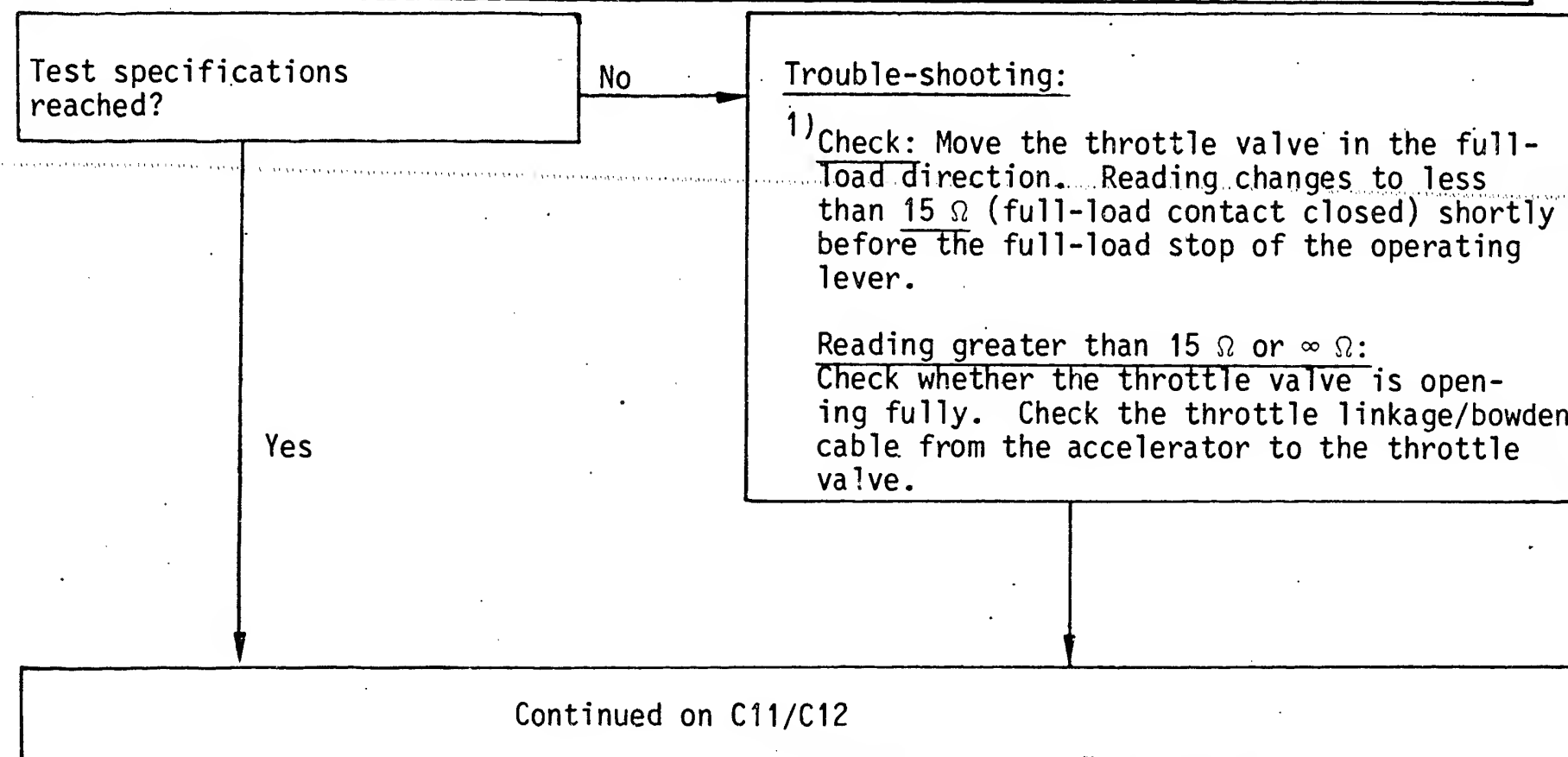


**C8**

Test with test adapter  
BMW 6 and 7 series



Test step 4 Operation		Reading	Testing
Program selector switch position	4	Accelerator in part-load position:	Component: Throttle-valve switch Installation position: Directly on throttle shaft
Measuring instrument: Ohmmeter		$\infty \Omega$	
Measuring range: 0 to 10 k $\Omega$		Accelerator at full-load stop:	Operation: Full-load contact between terminal 3 and ground
Test sockets (blue and black)	$\Omega$	Less than <u>15 <math>\Omega</math></u> <sup>1)</sup> (Measured value is influenced by protective resistor in adapter)	
Control unit and pump relay 1 not plugged in			Malfunction: Resistance greater than 15 $\Omega$ or $\infty \Omega$
Operation in vehicle: Ignition off			



Design of throttle-valve switch up to 8.1980 date of manufacture

- 1 = Microswitch 1 for idle
- 2 = Microswitch 2 for full load
- 3 = Carrier plate for microswitches 1 and 2
- 4 = Fastening screws for carrier plate
- 5 = Operating lever
- 6 = Direction of air
- 7 = Throttle valve assembly
- 8 = Fitting for air hose to start valve

**C 9**

Test with test adapter  
BMW 6 and 7 series



**C 10**

Test with test adapter  
BMW 6 and 7 series



Trouble-shooting - test step 4  
(continued)

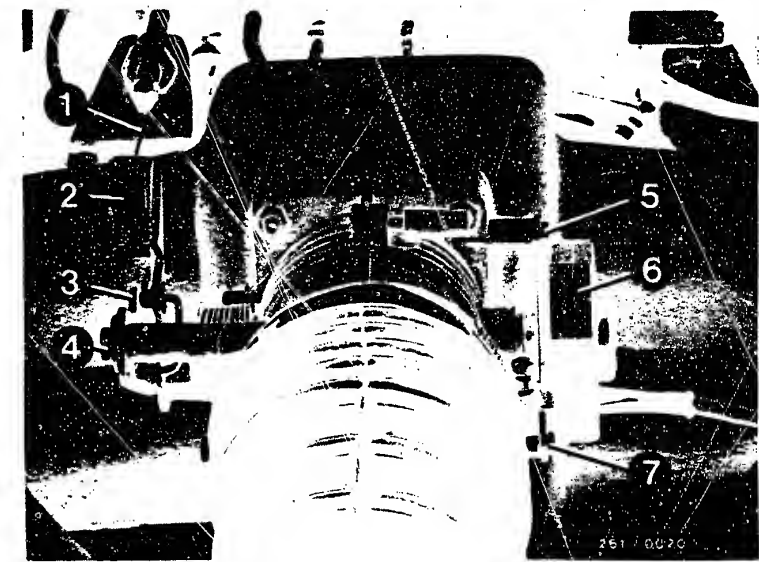
In vehicles up to 8.1980 date of manufacture:

Check microswitch for full load as well as leads 3, 43 and 50.

In vehicles as of 8.1980 date of manufacture:

Check Bosch throttle-valve switch as well as leads 3 and 53 (ground).

Yes



Design of throttle-valve switch as of 8.1980 date of manufacture

- 1 = Throttle cable in full-load position
- 2 = Throttle-valve stop bracket
- 3 = Idle stop for throttle valve
- 4 = Fastening screw for idle stop
- 5 and 7 = Fastening screws for throttle-valve switch
- 6 = Throttle-valve switch

Continued on C13/C14

**C11**

Test with test adapter  
BMW 6 and 7 series



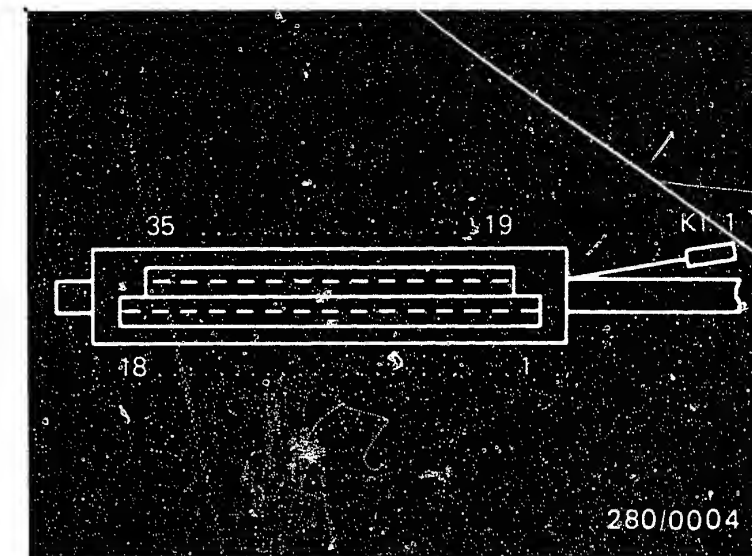
**C12**

Test with test adapter  
BMW 6 and 7 series





Test step 5		Reading	Testing	
Operation				
Program selector switch position	5	General: Less than 15 $\Omega$	Component: Control-map switch or lead if switch not installed.	
Measuring instrument: Ohmmeter		(Measured value is influenced by protective resistor in adapter)		
Measuring range: 0 to 10 k $\Omega$				
Test sockets (blue and black)	$\Omega$		735i Automatic (no control-map switch contained):	Operation: Connection between terminal 35 and ground
Control unit and pump relay 1 <u>not</u> plugged in.				Malfunction: Resistance greater than 15 $\Omega$ or less in the case of 735i Automatic.
Operation in vehicle: <u>Ignition off</u>		$\infty \Omega$		



Top view of 35-pin multiple plug of Motronic wiring harness

K1. 1 (Term. 1) = Plug-in connection to tachometer and to diagnostic socket.

#### Trouble-shooting:

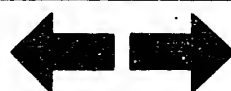
General: Check connection on control unit from term. 17 to term. 35 and lead 17 to ground terminal.

735i Automatic: Cut connection from control unit term. 17 to ground.

**C 13**

Test with test adapter

BMW 6 and 7 series



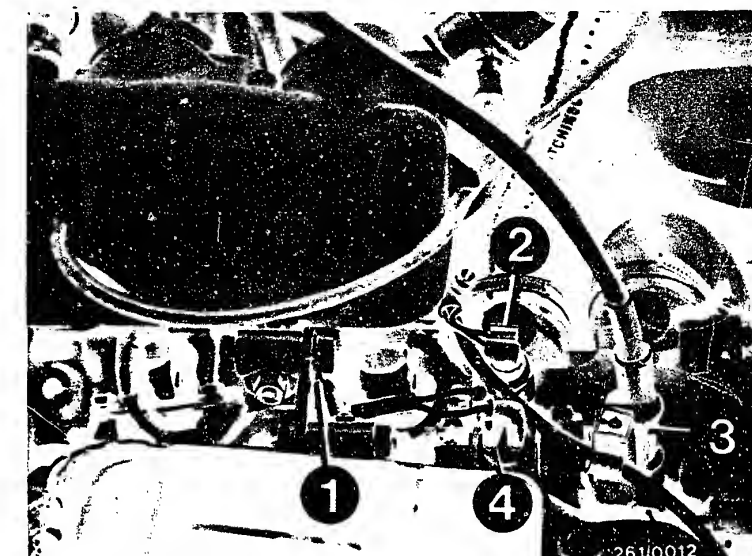
**C 14**

Test with test adapter

BMW 6 and 7 series



<u>Test step 6</u>		<u>Reading</u>	<u>Testing</u>
<u>Operation</u>			
Program selector switch position	6	Measured value depends on temperature, i.e. note engine temperature.  1.4...3.6 kΩ at + 15°C...+30°C  3...4.5 kΩ at +10°C 0.9...1.3 kΩ at +40°C 480...720 Ω at +60°C 250...390 Ω at +80°C	Component: Engine temperature sensor (NTC II)
Measuring instrument: Ohmmeter			
Measuring range: 0 to 10 kΩ			
Test sockets (blue and black)	Ω		
Control unit and pump relay 1 not plugged in			
<u>Operation in vehicle:</u> Ignition off.			Operation: Resistance between terminal 13 and ground  <



Up to 8.1980 date of manufacture:  
 1 = Ground terminal for 2 ground leads of Motronic  
 2 = Thermo-switch  
 3 = Diagnostic socket (diagnostic cable plugged in)  
 4 = Thermometer sensor

As of 8.1980 date of manufacture:  
 5 = Engine temperature sensor (NTC II in coolant), white plug

#### Trouble-shooting:

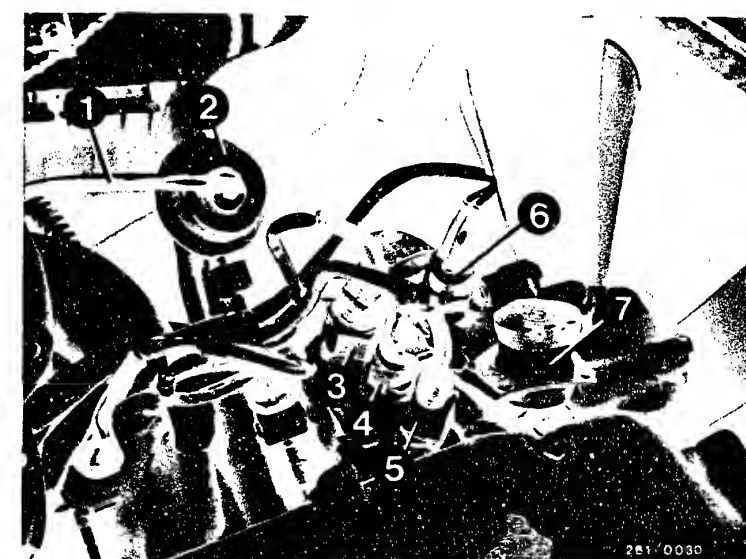
Remove plug on thermo-switch and repeat test. If test result O.K., check thermo-switch.

The thermo-switch is connected in parallel to the temperature sensor and closes between 110°C and 120°C. Make direct measurement at the thermo-switch at below 110°C using ohmmeter: Lead numbers 51 and 52 (connection optional).

Test result still outside tolerance:

Remove plug on temperature sensor and make direct resistance measurement. If necessary, replace temperature sensor.

Check leads 13, 49 and 51.



**C 15**

Test with test adapter  
 BMW 6 and 7 series



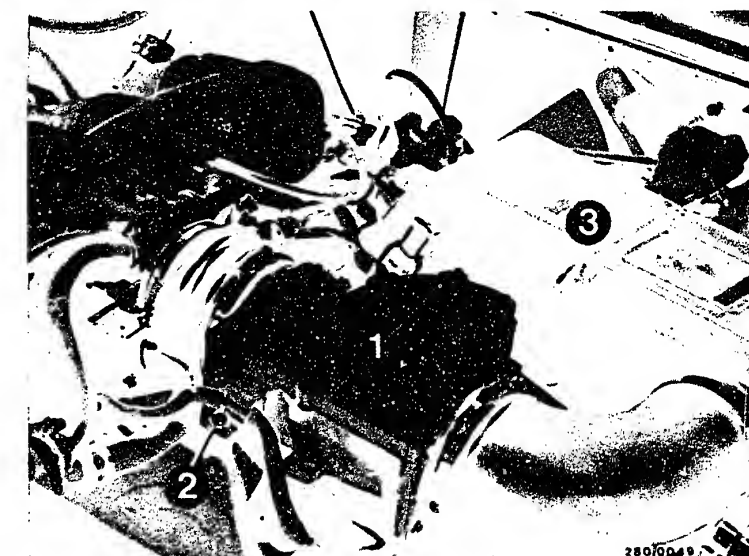
**C 16**

Test with test adapter  
 BMW 6 and 7 series





Test step 7 Operation		Reading	Testing
Program selector switch position	7	Measured value depends on temperature, i.e. note intake air temperature.  1.5...3.3 k $\Omega$ at +15°C...+30°C  3.4...4.1 k $\Omega$ at +10°C 1 ...1.2 k $\Omega$ at +40°C 540...660 $\Omega$ at +60°C 290...350 $\Omega$ at +80°C	Component: Air temperature sensor (NTC I) in air-flow sensor
Measuring instrument: Ohmmeter			Operation:  Resistance between terminal 22 and ground
Measuring range: 0 to 10 k $\Omega$			
Test sockets (blue and black)	$\Omega$		
Control unit and pump relay 1 not plugged in			Malfunction:  Resistance outside tolerance
Operation in vehicle: Ignition off			



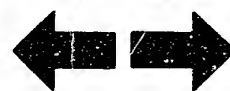
- 1 = Air-flow sensor  
 2 = Bypass screw  
 3 = Air filter

#### Trouble-shooting:

Remove plug on air-flow sensor and make direct resistance measurement at term.22 and term. 6. If test result outside tolerance, replace air-flow sensor.  
 Check leads 6 and 22.

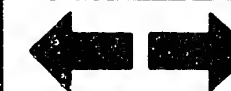
**C 17**

Test with test adapter  
 BMW 6 and 7 series

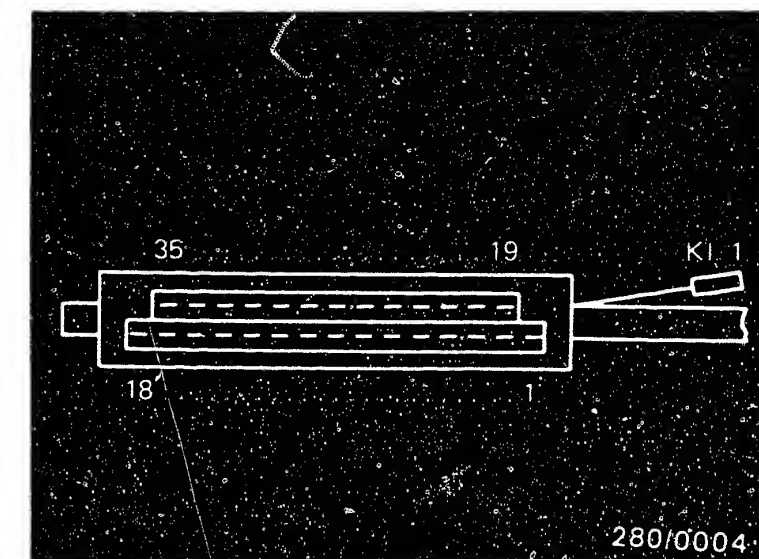


**C 18**

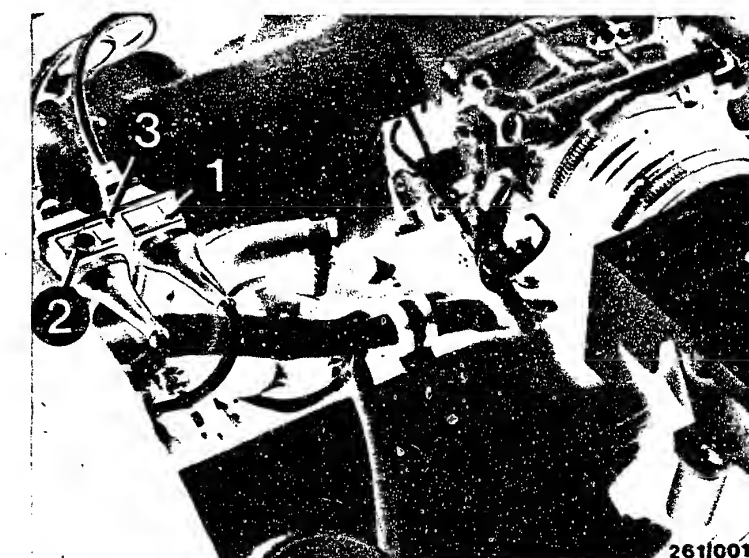
Test with test adapter  
 BMW 6 and 7 series



<u>Test step 8</u>		<u>Reading</u>	<u>Testing</u>
<u>Operation</u>			
Program selector switch position	8	Greater than 1 MΩ	<u>Component:</u> Engine-speed sensor
Measuring instrument: Ohmmeter			
Measuring range: min. 1 MΩ			<u>Operation:</u>
Test sockets (blue and black)	Ω		Insulation between terminal 8 and ground
Control unit and pump relay 1 not plugged in			<u>Malfunction:</u>
<u>Operation in vehicle:</u> Ignition off			Resistance less than 1 MΩ



Top view of 35-pin multiple plug of Motronic wiring harness  
 Kl. 1 (Term. 1) = Plug-in connection to tachometer and to diagnostic socket  
 1 = Connector for engine-speed sensor  
 2 = Connector for reference-mark sensor with marking  
 3 = Holding plate



Resistance approx. 0  $\Omega$ :  
 Check lead 8 for short circuit to ground.

Resistance 0.7...1.7 k $\Omega$ :  
 Check lead 27 for short circuit to ground.

Holding plate for plug connector broken off?

**C19**

Test with test adapter  
 BMW 6 and 7 series

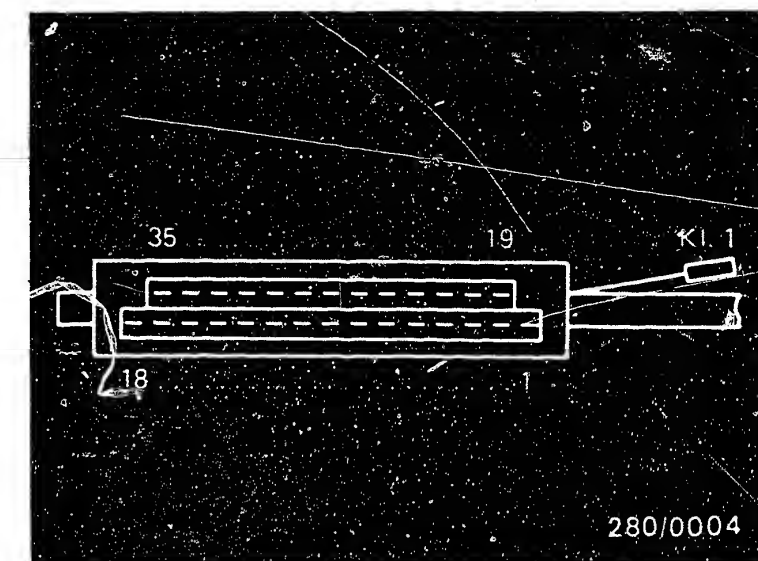


**C20**

Test with test adapter  
 BMW 6 and 7 series



Test step 9. Operation		Reading	Testing
Program selector switch position	9	Greater than 1 M $\Omega$	Component: Reference-mark sensor
Measuring instrument: Ohmmeter			Operation: Insulation between terminal 25 and ground
Measuring range: min. 1 M $\Omega$			
Test sockets (blue and black)	$\Omega$		
Control unit and pump relay 1 not plugged in			Malfunction: Resistance less than 1 M $\Omega$
Operation in vehicle: Ignition off			



Top view of 35-pin multiple plug of Motronic wiring harness  
 Kl. 1 (Term. 1) = Plug-in connection to tachometer and to diagnostic socket  
 1 = Connector for engine-speed sensor  
 2 = Connector for reference-mark sensor with marking  
 3 = Holding plate

#### Trouble-shooting:

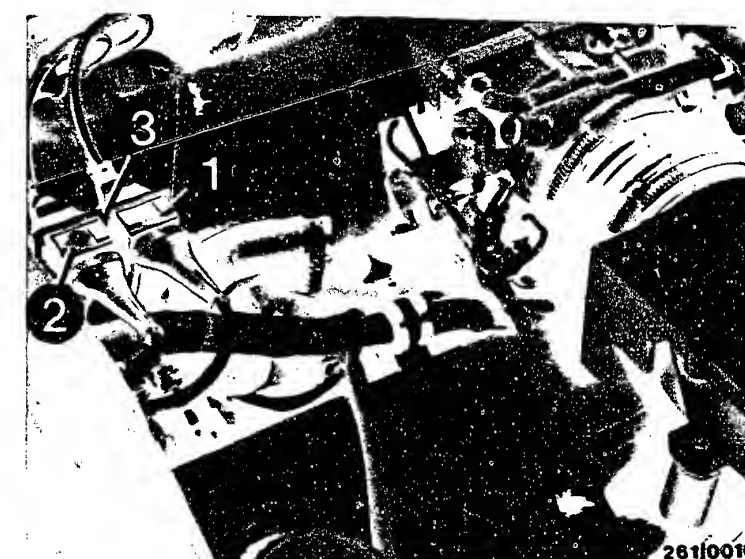
Resistance approx. 0  $\Omega$ :

Check lead 25 for short circuit to ground.

Resistance 0.7...1.7 k $\Omega$ :

Check lead 26 for short circuit to ground.

Holding plate for plug connector broken off?



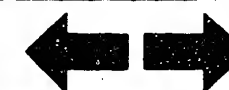
**C 21**

Test with test adapter  
BMW 6 and 7 series

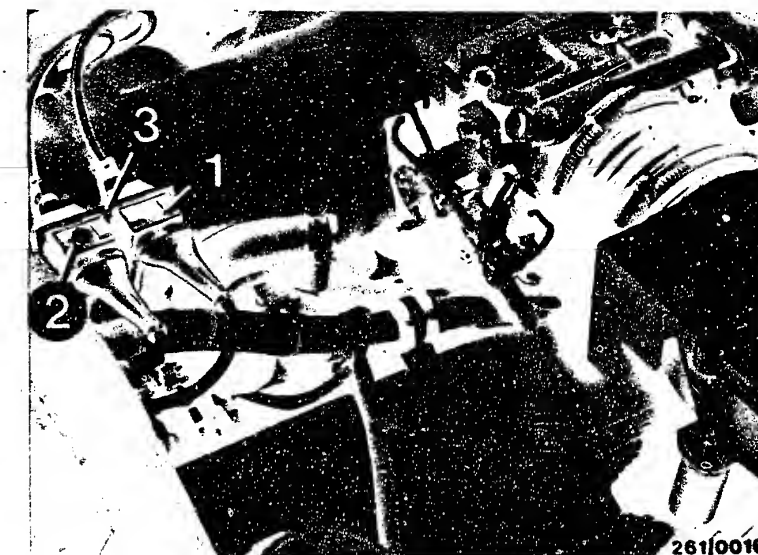
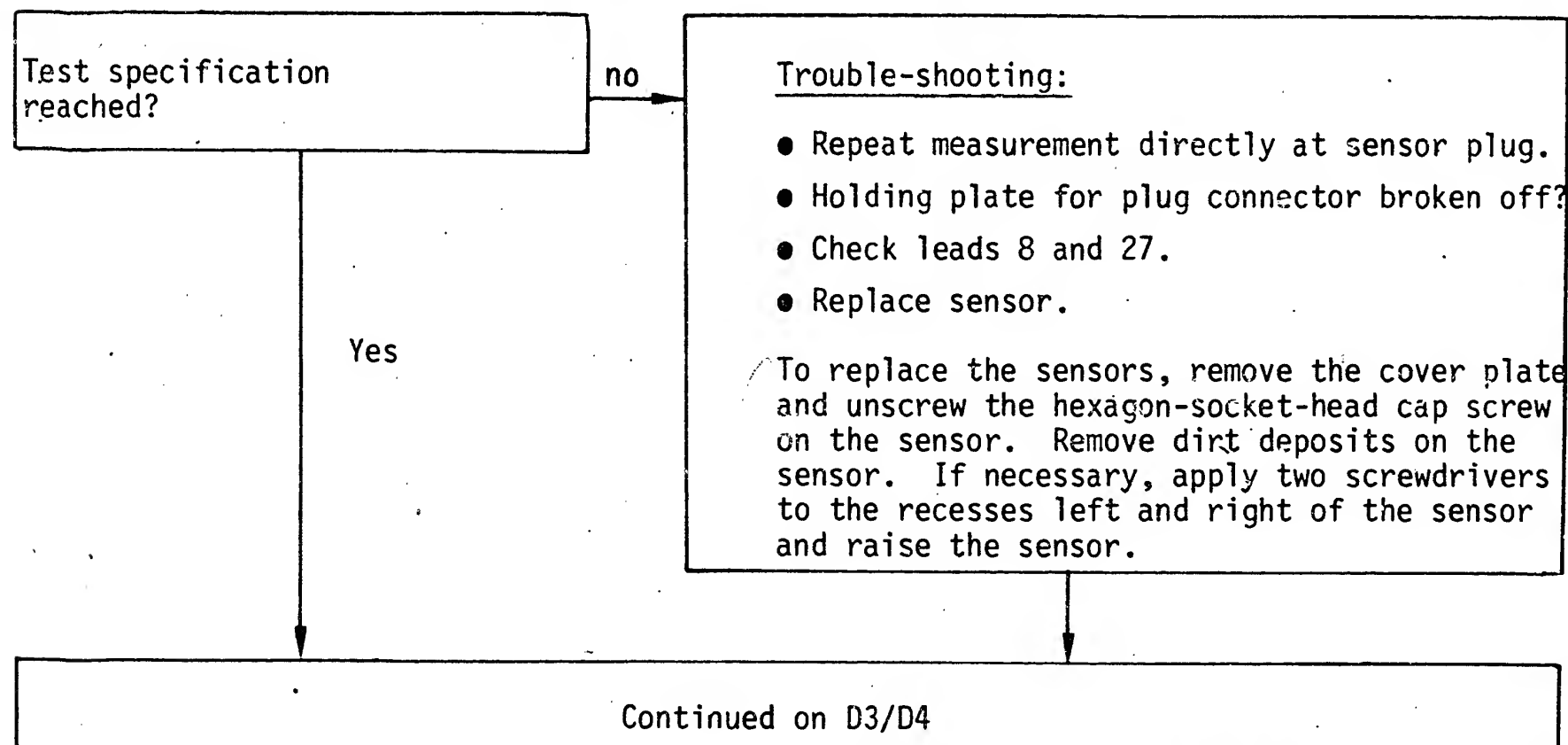


**C 22**

Test with test adapter  
BMW 6 and 7 series



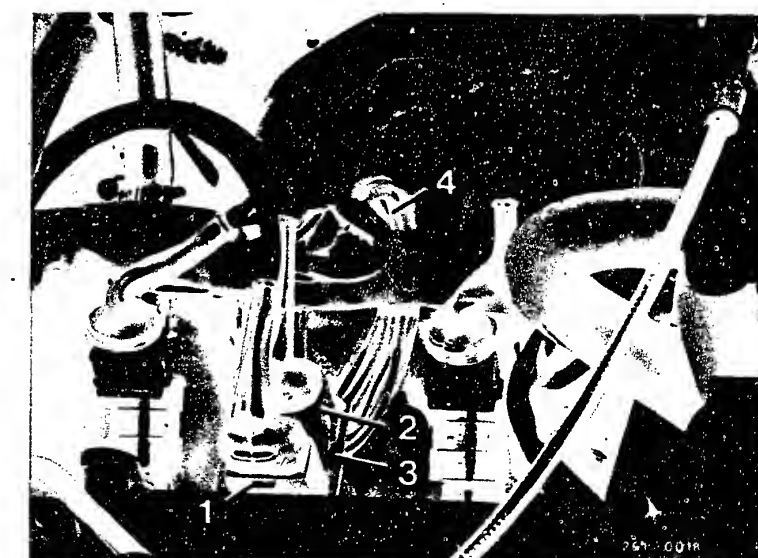
Test step 10		Reading	Testing
Operation			
Program selector switch position	10	0.6...1.6 kΩ	<u>Component:</u> Engine-speed sensor
Measuring instrument: Ohmmeter			
Measuring range: 0 to 10 kΩ			
Test sockets (blue and black)	Ω		<u>Installation position:</u> In ring gear housing on circumference of flywheel ring gear
Control unit and pump relay 1 <u>not</u> plugged in.			<u>Operation:</u> Internal resistance between terminals 8 and 27
Operation in vehicle: Ignition off			



Vehicles up to 8.1980 date of manufacture:

- 1 = Connector of engine-speed sensor
- 2 = Connector of reference-mark sensor (marked)
- 3 = Holding plate
- 4 = Central ground for Motronic

Vehicles as of 8.1980 date of manufacture:



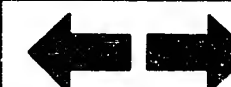
**D1**

Test with test adapter  
BMW 6 and 7 series

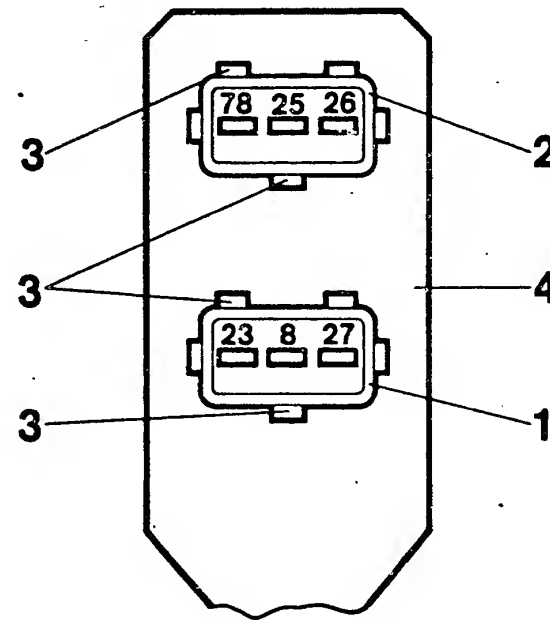


**D2**

Test with test adapter  
BMW 6 and 7 series



# Trouble-shooting - test step 10 (continued)



261/0017

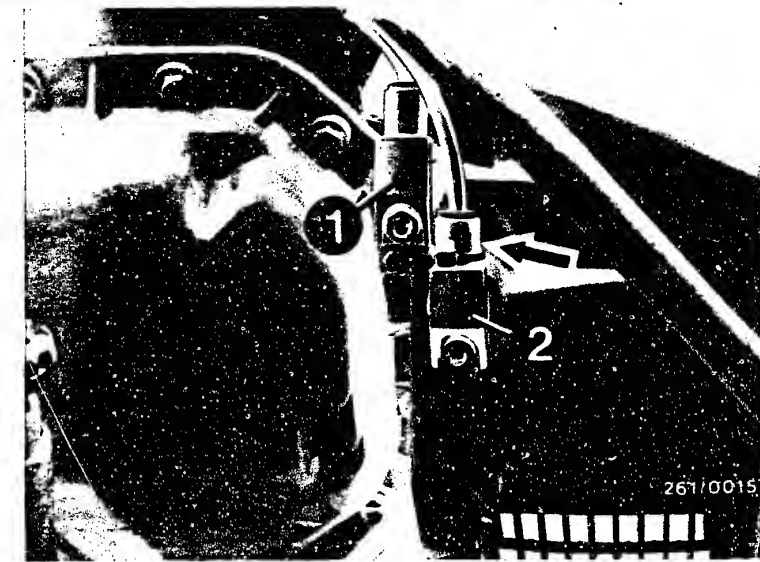
Top view of sensor connectors (configuration as of 8.1980 date of manufacture)

- 1 = Connector of engine-speed sensor
- 2 = Connector of reference-mark sensor with marking
- 3 = Locating lugs
- 4 = Holding plate for sensor connectors

78, 25, 26, 23, 8, 27 = Terminal and lead numbers

Yes

Continued on D5/D6



Vehicle with automatic transmission

- 1 = Engine-speed sensor
- 2 = Reference-mark sensor
- Arrow = Marking for reference-mark sensor

**D3**

Test with test adapter  
BMW 6 and 7 series



**D4**

Test with test adapter  
BMW 6 and 7 series





Yes

### Trouble-shooting - test step 10 (continued)

Before installing the sensors, make sure that no metallic parts are sticking to the sensor (sensors contain permanent magnets). Grease sensors with Molykote Longterm 2.

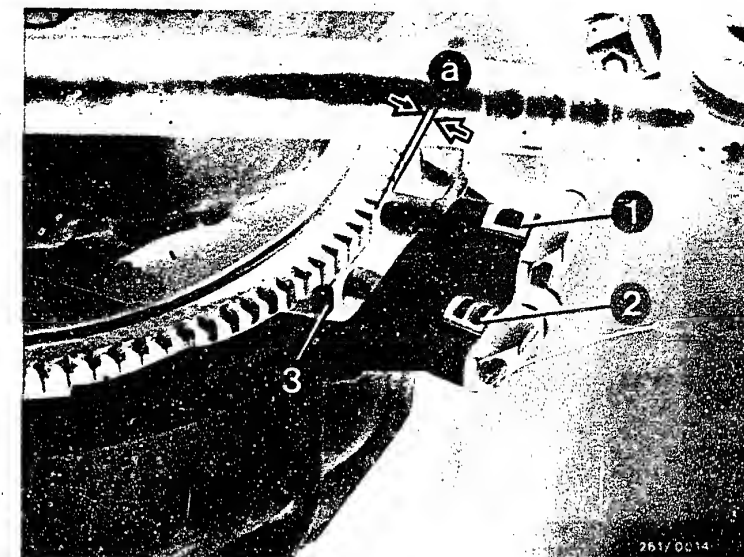
Do not mix up the sensors when installing!

Pay attention to the marking: Reference-mark sensor with marking and grey plug.  
Engine-speed sensor without marking, black plug.

The sensors are pushed as far as they will go into the bore and are screwed down. Do not use force when fitting.

When installing make sure that the connectors are the right way round.

Make sure that the spring contacts in the plug are properly seated and lock in position correctly. It must not be possible to push back the spring contacts.



Vehicle with manually-shifted transmission (without cover plate)

- 1 = Engine-speed sensor, marking "D"
- 2 = Reference-mark sensor, marking "B"
- 3 = Reference mark on flywheel ring gear
- a = Air gap

Continued on D7/D8

**D5**

Test with test adapter  
BMW 6 and 7 series



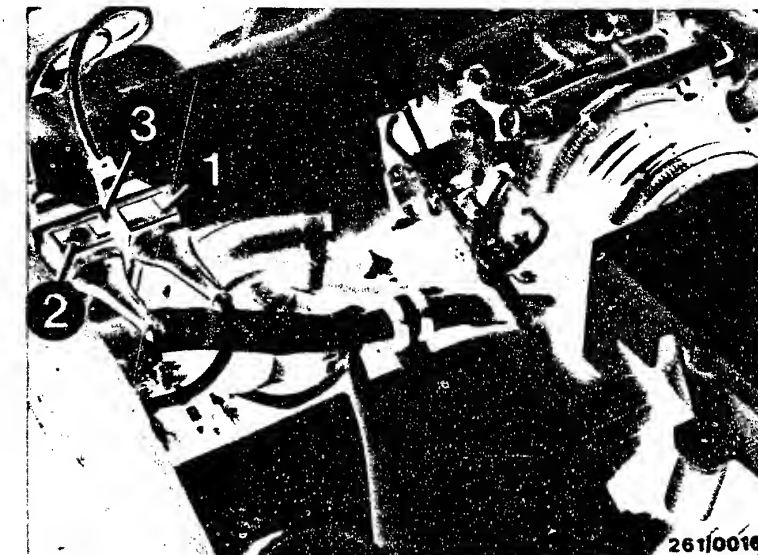
**D6**

Test with test adapter  
BMW 6 and 7 series



Test step 11		Reading	Testing
Operation			
Program selector switch Position	11		
Measuring instrument: Ohmmeter			
Measuring range: 0 to 10 kΩ			
Test sockets (blue and black)	Ω		
Control unit and pump relay 1 <u>not</u> plugged in			
Operation in vehicle: <u>Ignition off</u>			

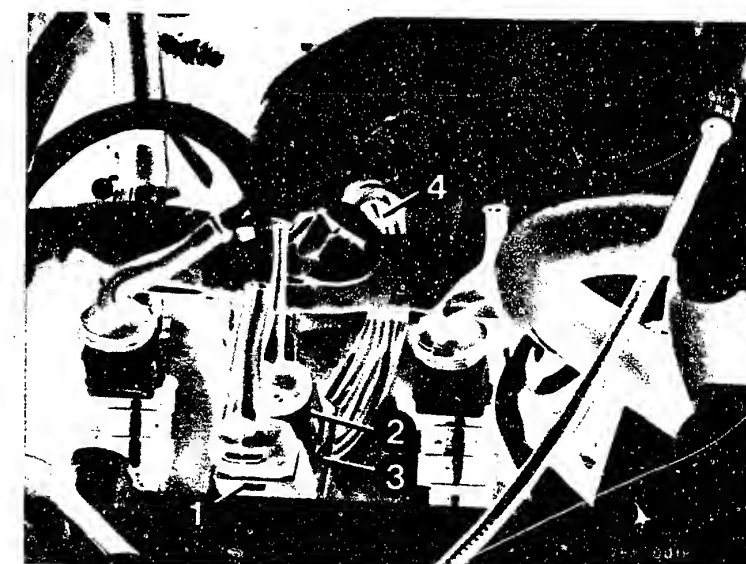
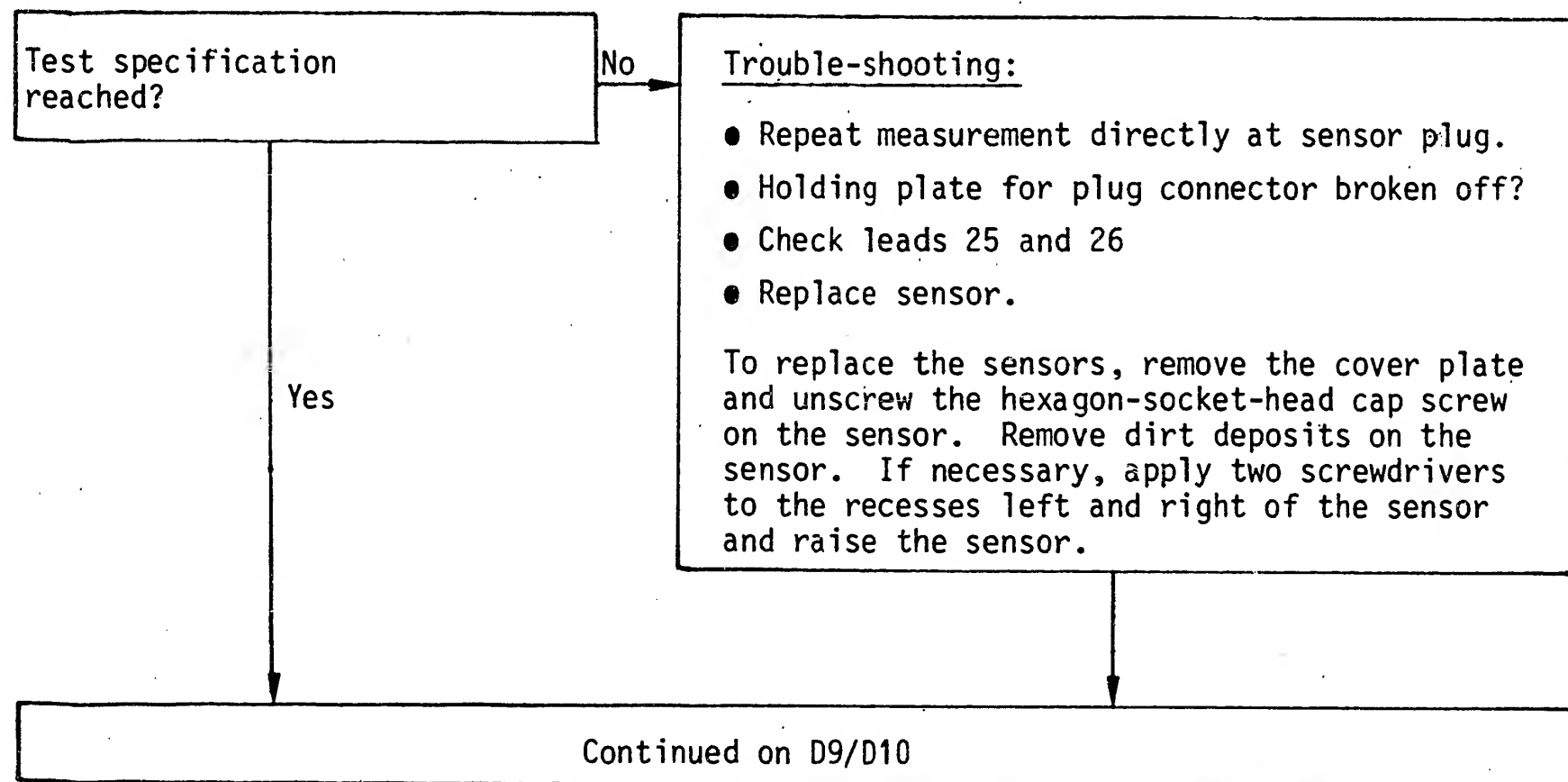
0.6...1.6 kΩ	<u>Component:</u> Reference-mark sensor
	<u>Installation position:</u> In ring gear housing on circumference of flywheel ring gear
	<u>Operation:</u> Internal resistance between terminals 25 and 26



Vehicles up to 8.1980 date of manufacture:

- 1 = Connector of engine-speed sensor
- 2 = Connector of reference-mark sensor (marked)
- 3 = Holding plate
- 4 = Central ground for Motronic

Vehicles as of 8.1980 date of manufacture:



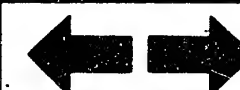
D7

Test with test adapter  
BMW 6 and 7 series

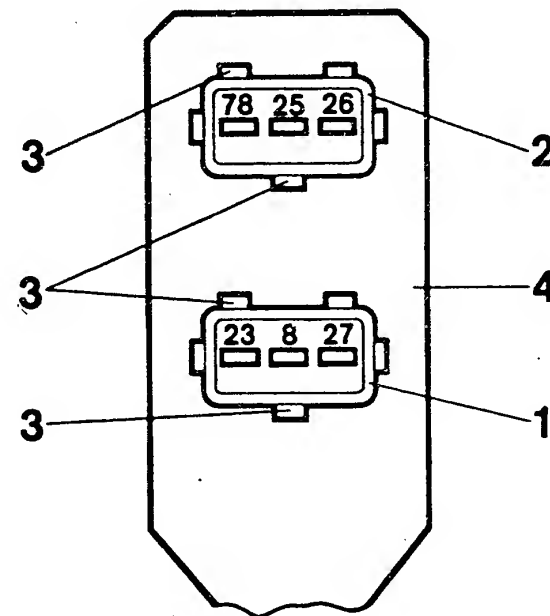


D8

Test with test adapter  
BMW 6 and 7 series



Trouble-shooting - test step 11  
(continued)



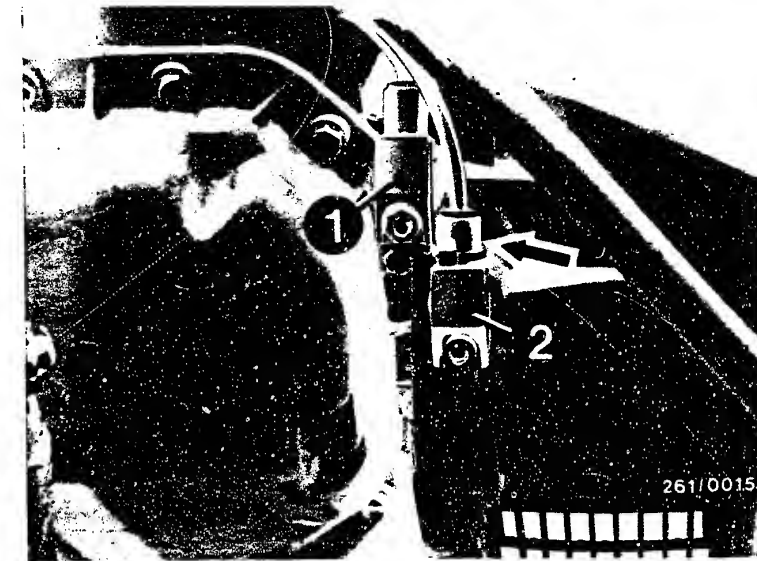
Top view of sensor connectors (configuration as of 8.1980 date of manufacture)

- 1 = Connector of engine-speed sensor
- 2 = Connector of reference-mark sensor with marking
- 3 = Locating lugs
- 4 = Holding plate for sensor connectors

78, 25, 26, 23, 8, 27 = Terminal and lead numbers

Yes

Continued on D11/D12



Vehicle with automatic transmission

- 1 = Engine-speed sensor
- 2 = Reference-mark sensor
- Arrow = Marking for reference-mark sensor

**D9**

Test with test adapter  
BMW 6 and 7 series



**D10**

Test with test adapter  
BMW 6 and 7 series





Yes

### Trouble-shooting - test step 11 (continued)

Before installing the sensors, make sure that no metallic parts are sticking to the sensor (sensors contain permanent magnets). Grease sensors with Molykote Longterm 2.

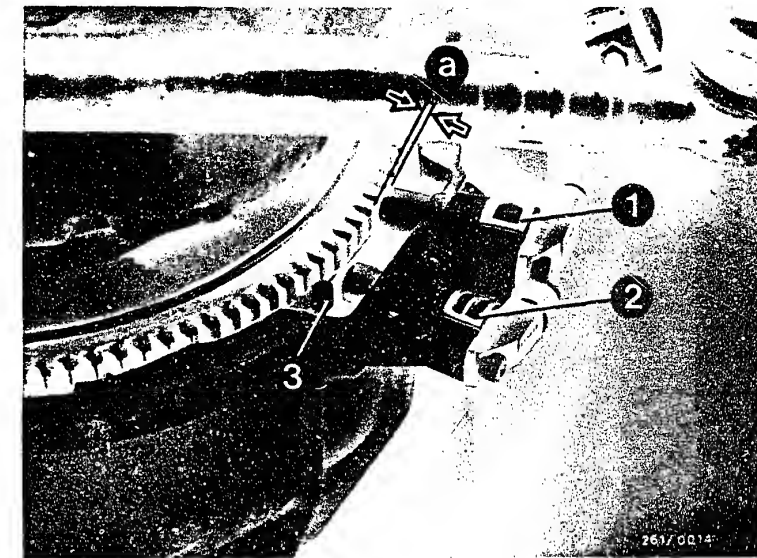
Do not mix up the sensors when installing!

Pay attention to the marking: Reference mark sensor with marking and grey plug.  
Engine-speed sensor without marking, black plug.

The sensors are pushed as far as they will go into the bore and are screwed down. Do not use force when fitting.

When installing make sure that the connectors are the right way round.

Make sure that the spring contacts in the plug are properly seated and lock in position correctly. It must not be possible to push back the spring contacts.



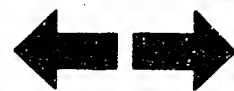
Vehicle with manually-shifted transmission (without cover plate)

- 1 = Engine-speed sensor, marking "D"
- 2 = Reference-mark sensor, marking "B"
- 3 = Reference mark on flywheel ring gear
- a = Air gap

Continued on D13/D14

**D11**

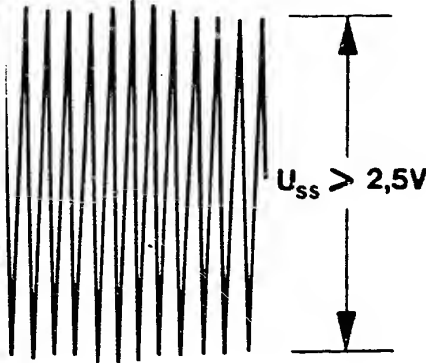
Test with test adapter  
BMW 6 and 7 series

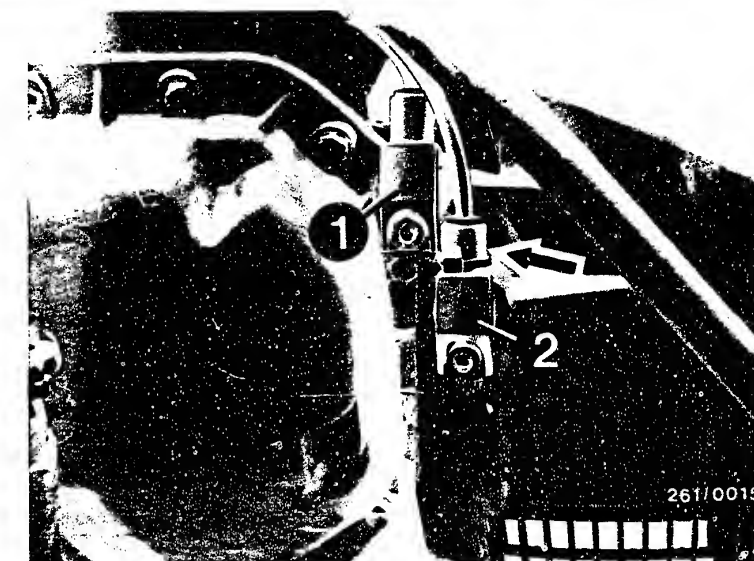
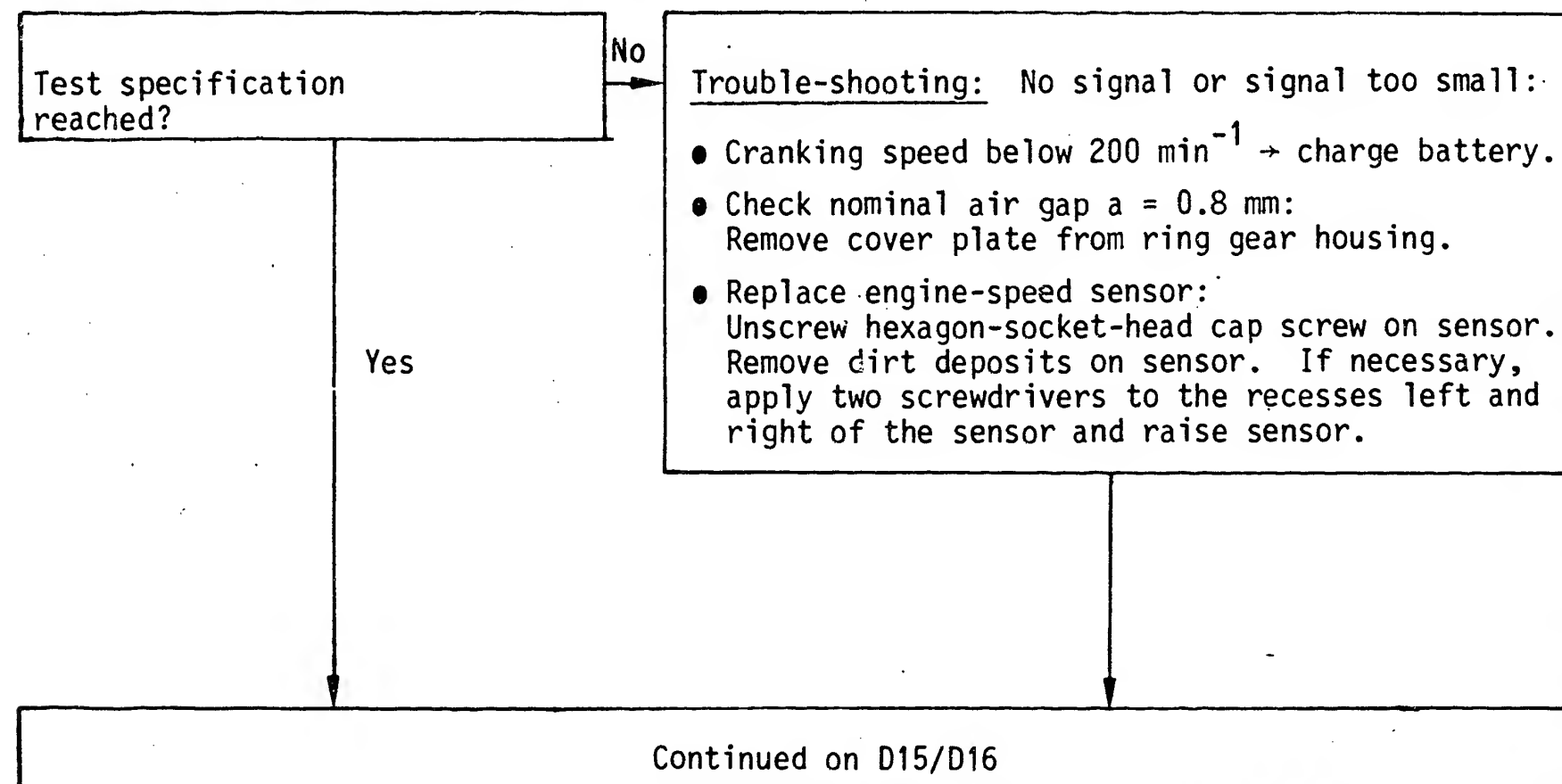


**D12**

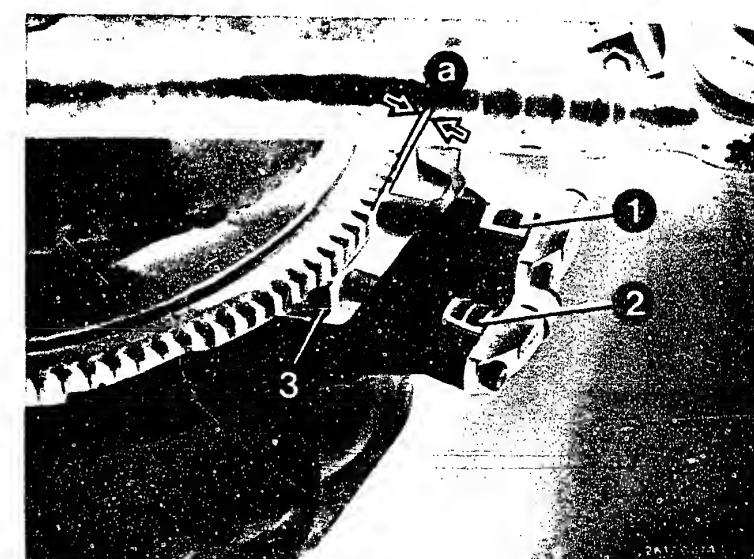
Test with test adapter  
BMW 6 and 7 series



Test step 12		Reading	Testing
Operation			
Program selector switch program	12		Component: Engine-speed sensor Installation position: In ring gear housing on circumference of flywheel ring gear
Measuring instrument: Oscilloscope			Operation: Amplitude (signal) at terminals 8 and 27.
Measuring range: Special input			
Test wells, red clip to red well, black clip to black well			Malfunction: No signal or signal too small. Incorrect signal.
Control unit and pump relay 1 not plugged in			
Operation in vehicle: Operate starting motor (shift gear to neutral)		Lever to left-hand stop (calibrated voltage range)	

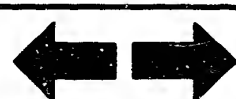


- 1 = Engine-speed sensor  
 2 = Reference-mark sensor  
 Arrow = Marking for reference-mark sensor  
 3 = Reference mark on flywheel ring gear  
 a = Air gap



**D 13**

Test with test adapter  
 BMW 6 and 7 series



**D 14**

Test with test adapter  
 BMW 6 and 7 series



Trouble-shooting - test step 12  
(continued)

- Incorrect signal (greatly extended in the picture):  
Heavily damaged tooth on starting motor ring gear. Replace ring gear.

Before installing the sensors, make sure that no metallic parts are sticking to the sensor (sensors contain permanent magnets). Grease sensors with Molykote Longterm 2.

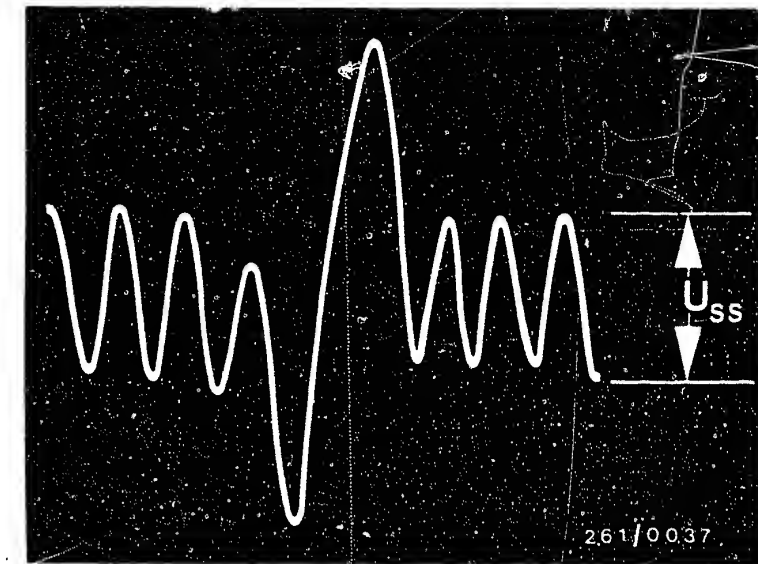
Do not mix up the sensors when installing!

Pay attention to marking: Reference-mark sensor with marking and grey plug.  
Engine-speed sensor without marking, black plug.

The sensors are pushed as far as they will go into the bore and are screwed down. Do not use force when fitting.

Yes

Continued on D17/D18



**D 15**

Test with test adapter  
BMW 6 and 7 series



**D 16**

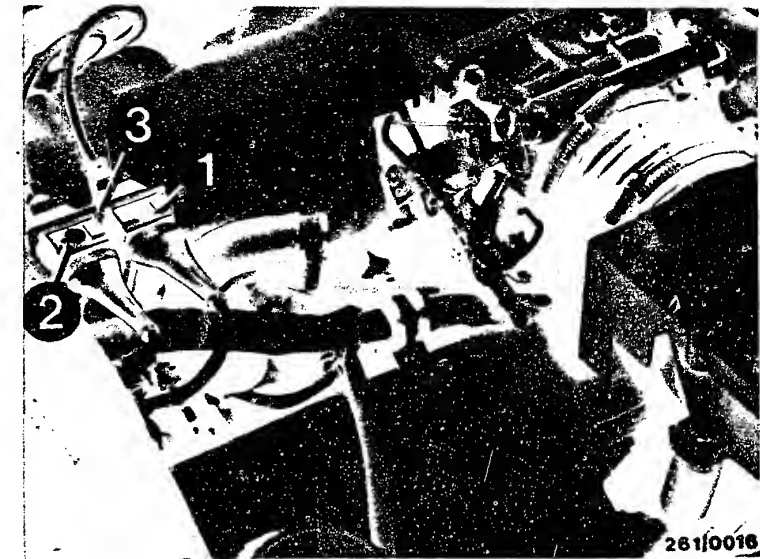
Test with test adapter  
BMW 6 and 7 series



Trouble-shooting - test step 12  
(continued)

When installing make sure that the connectors are the right way round.

Make sure that the spring contacts in the plug are properly seated and lock in position correctly. It must not be possible to push back the spring contacts.



Vehicles up to 8.1980 date of manufacture

- 1 = Connector of engine-speed sensor
- 2 = Connector of reference-mark sensor (marked)
- 3 = Holding plate
- 4 = Central ground for Motronic

Vehicles as of 8.1980 date of manufacture



Yes

Continued on E1/E2

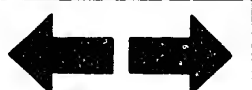
**D17**

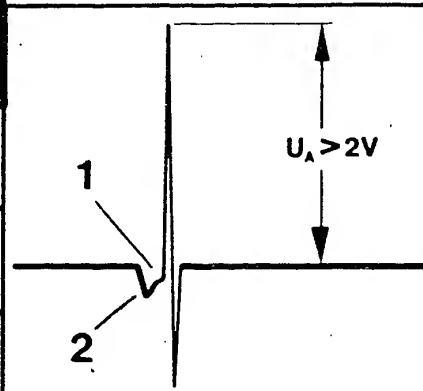
Test with test adapter  
BMW 6 and 7 series

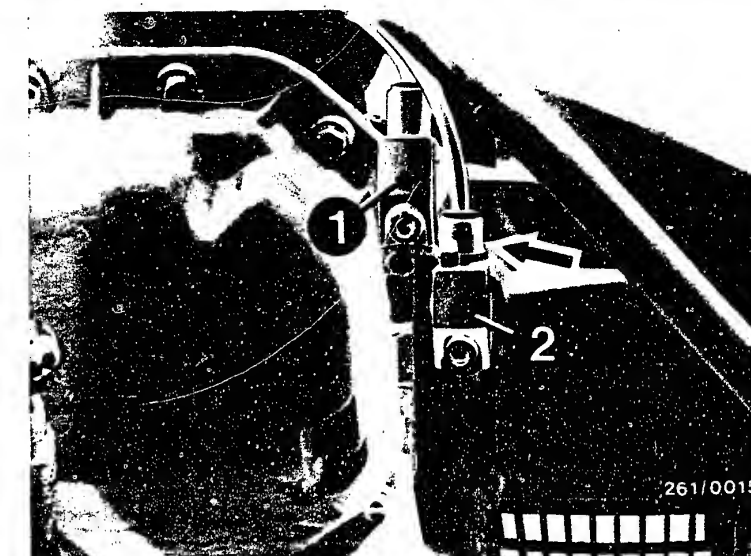
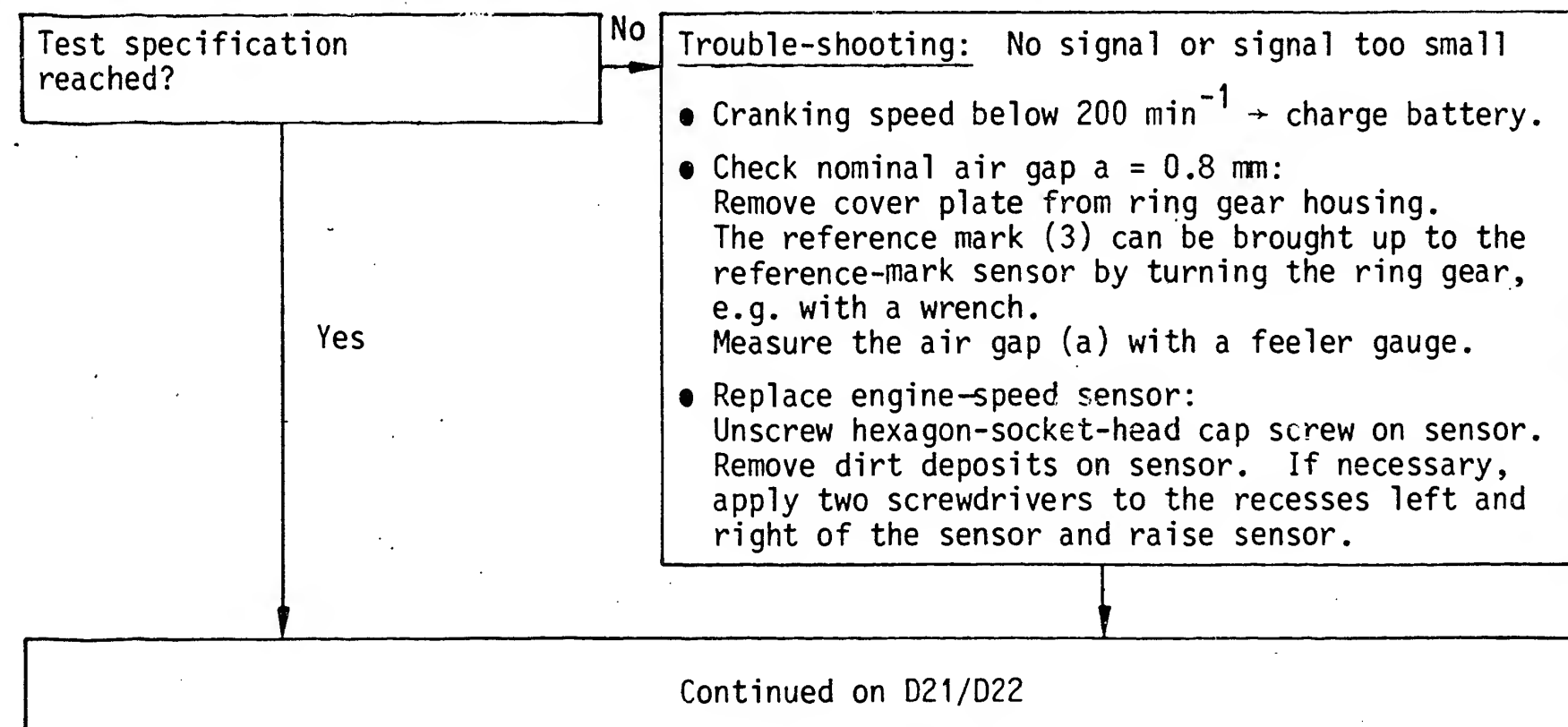


**D18**

Test with test adapter  
BMW 6 and 7 series



Test step 13		Reading	Testing	
Operation				
Program selector switch position	13		Component: Reference-mark sensor Installation position: In ring gear housing on circumference of flywheel ring gear.	
Measuring instrument: Oscilloscope			1 = Automatic 2 = Manually-shifted transmission Lever to left-hand stop (calibrated voltage range)	Operation: Amplitude (signal) at terminals 25 and 26
Measuring range: Special input				
Test wells: Red clip to red well, black clip to black well.				
Control unit and pump relay not plugged in.			Malfunction: No signal or signal too small. Incorrect signal.	
Operation in vehicle: Operate starting motor (shift gear to neutral)				

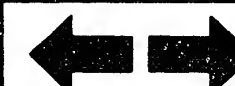
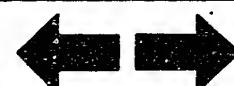
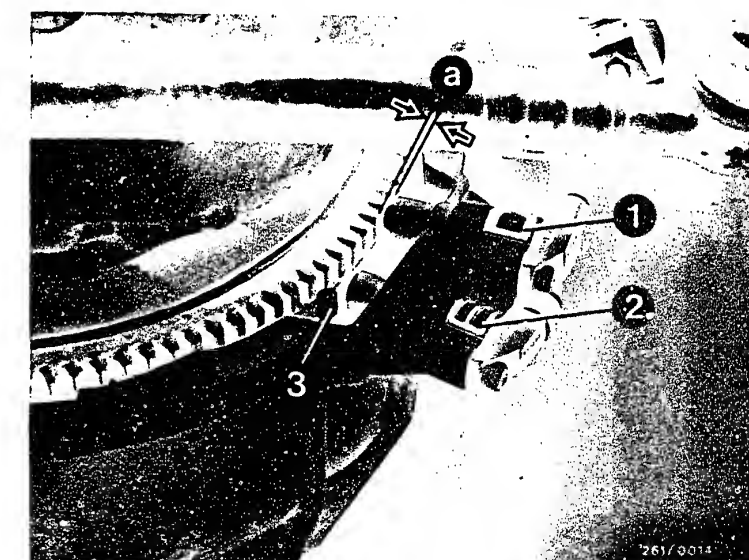


#### Vehicles with automatic transmission

- 1 = Engine-speed sensor
- 2 = Reference-mark sensor
- 3 = Reference mark on flywheel ring gear

Arrow = Marking for reference mark sensor

a = Air gap  
Vehicles with manually-shifted transmission.

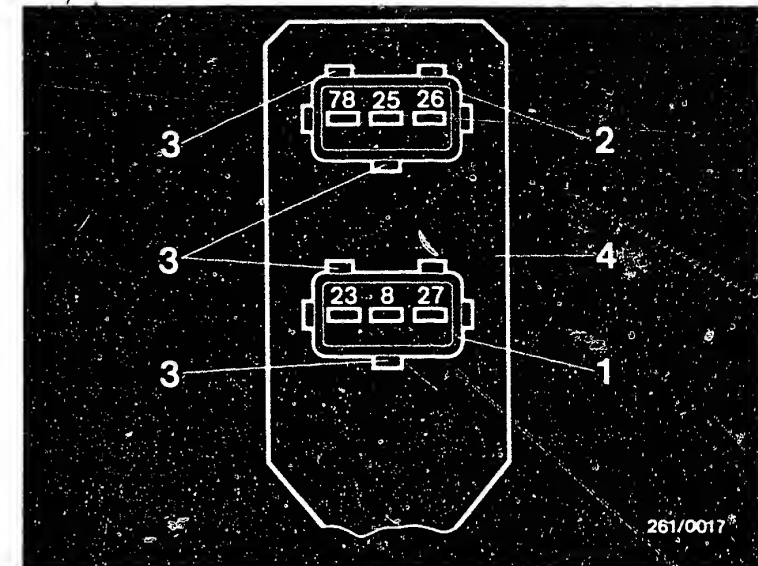




Trouble-shooting - test step 13  
(continued)

- Incorrect signal:

Incorrect if negative peak comes first.  
Check assignment of leads according to  
circuit diagram and illustration  
opposite.



Top view of sensor connectors  
(configuration as of 8.1980 date  
of manufacture)

- 1 = Connector of engine-speed sensor
- 2 = Connector of reference-mark  
sensor with marking
- 3 = Locating lugs
- 4 = Holding plate for sensor  
connectors

78, 25, 26, 23, 8, 27 =  
Terminal and lead numbers

Yes

Continued on D23/D24

**D21**

Test with test adapter  
BMW 6 and 7 series



**D22**

Test with test adapter  
BMW 6 and 7 series





Yes

### Trouble-shooting - test step 13 (continued)

Before installing the sensors, make sure that no metallic parts are sticking to the sensor (sensors contain permanent magnets). Grease sensors with Molykote Longterm 2.

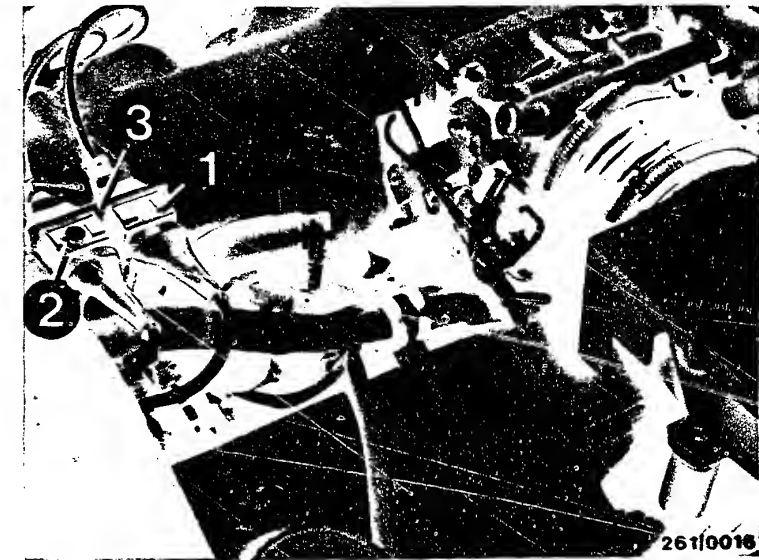
Do not mix up the sensors when installing!

Pay attention to the marking: Reference mark sensor with marking and grey plug.  
Engine-speed sensor without marking, black plug.

The sensors are pushed as far as they will go into the bore and are screwed down. Do not use force when fitting.

When installing make sure that the connectors are the right way round.

Make sure that the spring contacts in the plug are properly seated and lock in position correctly. It must not be possible to push back the spring contacts.



Vehicles up to 8.1980 date of manufacture:

- 1 = Connector of engine-speed sensor
- 2 = Connector of reference-mark sensor (marked)
- 3 = Holding plate
- 4 = Central ground for Motronic

Vehicles as of 8.1980 date of manufacture



Continued on E1/E2

**D23**

Test with test adapter

BMW 6 and 7 series



**D24**

Test with test adapter

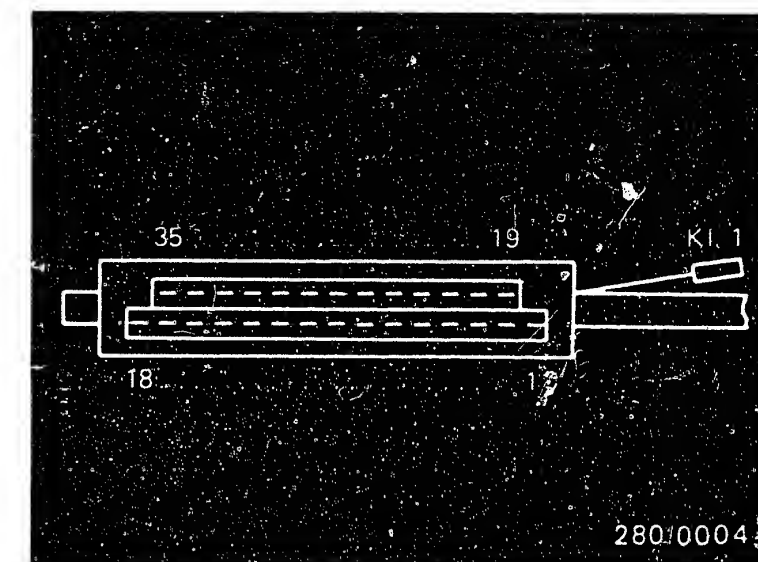
BMW 6 and 7 series



Test step 14		Reading	Testing
Operation			
Program selector switch position	14	8 ... 15 V while cranking	<u>Component:</u> Lead 4 from starting motor terminal 50 to control unit terminal 4
Measuring instrument: Voltmeter			
Measuring range: up to 15 V			
Test sockets (red = + black = ground)	V		<u>Operation:</u> Voltage test at terminal 4
Control unit and pump relay 1 not plugged in			
Operation in vehicle: Operate starting motor (shift gear to neutral)			<u>Malfunction:</u> Voltage less than 8 V

#### Trouble-shooting:

- Test for voltage drop at starting motor terminal 50.
- Check lead 4 from control unit terminal 4 to starting motor terminal 50.



Top view of 35-pin multiple plug of Motronic wiring harness

K1. 1 (Term. 1) = Plug-in connection to tachometer and to diagnostic socket

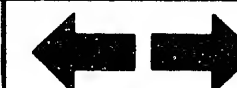
**E1**

Test with test adapter  
BMW 6 and 7 series

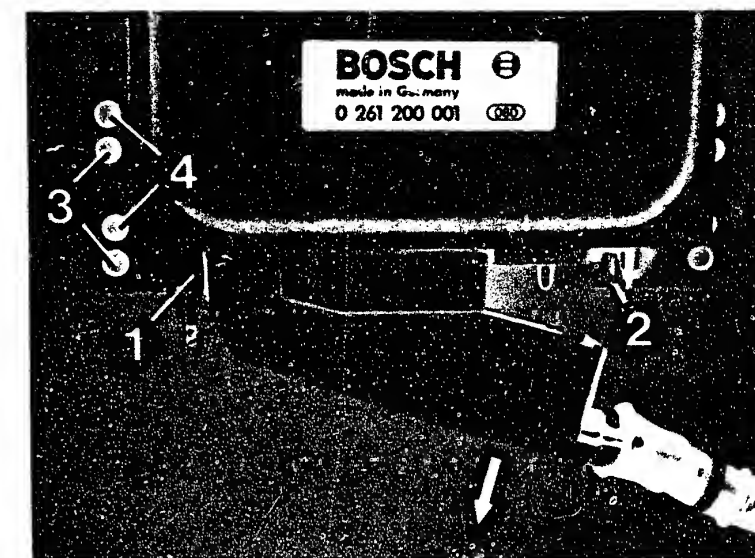


**E2**

Test with test adapter  
BMW 6 and 7 series



<u>Test step 15</u>		<u>Reading</u>	<u>Testing</u>
<u>Operation</u>			<u>Component: Control unit</u>
Program selector switch position	15	<u>Greater than 8.0 V</u>	
Measuring instrument: Voltmeter			
Measuring range: up to 15 V			
Test sockets (red = + black = ground)	V		<u>Operation:</u> Supply voltage for air-flow sensor at terminal 9 and ground.
Control unit connected 1); pump relay 1 not plugged in			
<u>Operation in vehicle:</u> Switch on ignition			<u>Malfunction:</u> Voltage less than 8 V



- 1 = Locating lug  
2 = Detent  
3 = Mounting holes - 6 series  
4 = Mounting holes - 7 series

1) Switch off ignition before installing control unit.

#### Trouble-shooting:

- Check whether contact being made at control unit.
- Replace control unit

#### Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

**E3**

Test with test adapter

BMW 6 and 7 series



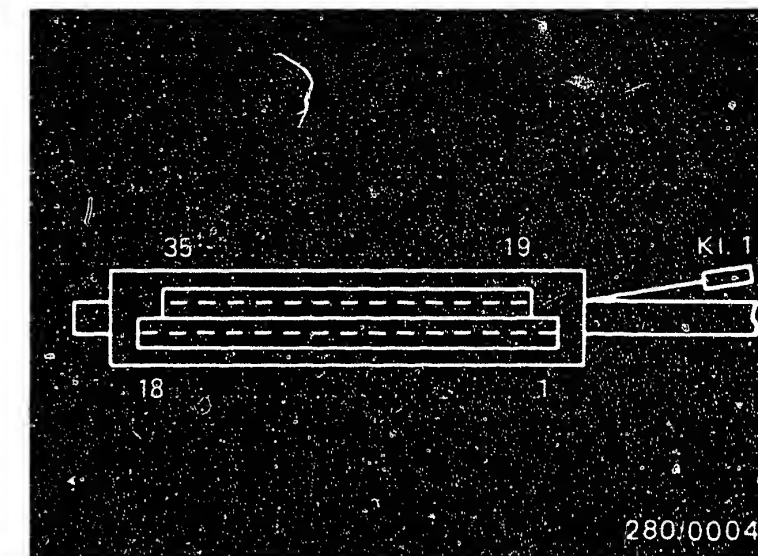
**E4**

Test with test adapter

BMW 6 and 7 series

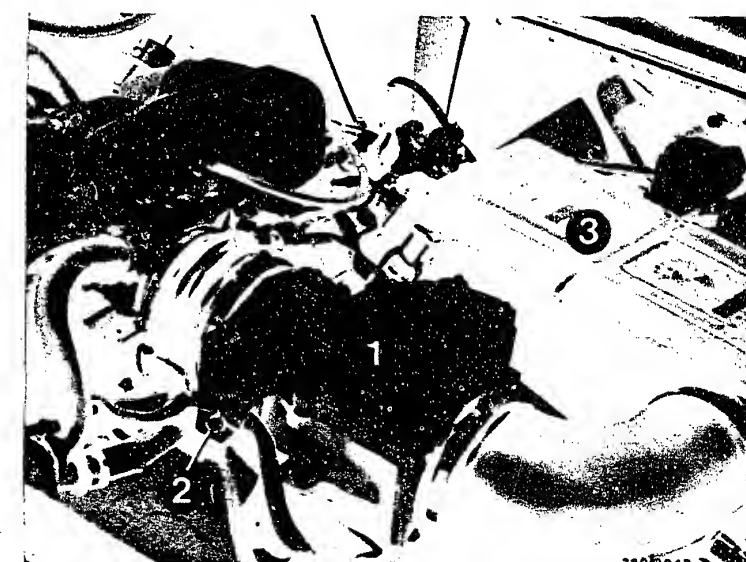


Test step 16 Operation		Reading	Testing
Program selector switch position	16	150...250 mV	Component: Air-flow sensor
Measuring instrument: Voltmeter		with air-flow sensor flap closed. Remove hose from air-flow sensor on air filter side and open sensor flap by hand. Sensor flap must not catch and must return automatically to its rest position when released.	
Measuring range: up to 1.5 V		With the sensor flap fully open the reading rises to above 8 V (change to different measuring range).	Operation: Divider voltage at terminal 7 and ground
Test sockets (red = + black = ground)	V		Malfunction: No voltage or voltage too low
Control unit connected, pump relay 1 not plugged in			
Operation in vehicle: Switch on ignition			



Top view of 35-pin multiple plug of Motronic wiring harness  
K1.1 (Term. 1) = Plug-in connection to tachometer and to diagnostic socket

- 1 = Air-flow sensor
- 2 = Bypass screw
- 3 = Air filter



#### Trouble-shooting:

- No reading: Check leads 6, 7 and 9 from air-flow sensor to control unit.
- Reading outside tolerance: Check whether air-flow sensor flap is closing fully. Replace air-flow sensor.

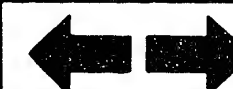
**E5**

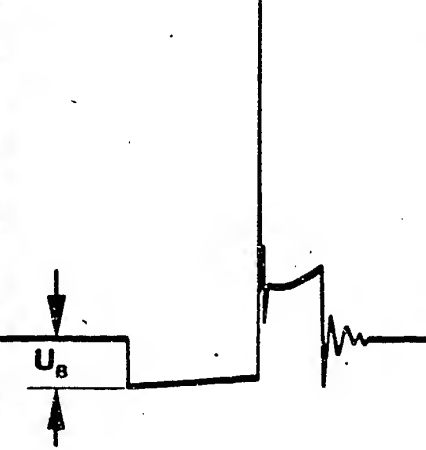
Test with test adapter  
BMW 6 and 7 series

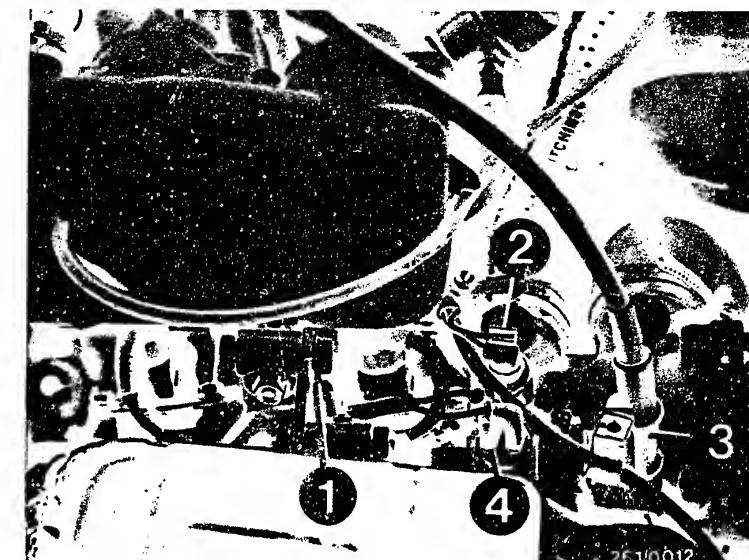


**E6**

Test with test adapter  
BMW 6 and 7 series



Test step 17		Reading	Testing
Operation			
Program selector switch position	17	Primary signal	Component: Ignition coil, H.T. ignition cables. Installation position of ignition coil: in engine compartment at front right
Measuring instrument: Oscilloscope			
Measuring range: Primary input			
Measurement on ignition coil: Green clip to terminal 1, yellow clip to terminal 15, triggering on cylinder 1			Operation: Primary signal at ignition coil terminals 1 and 15
Control unit connected, pump relay 1 not plugged in			Malfunction: No signal or signal incorrect
Operation in vehicle: Operate starting motor (shift gear to neutral)			

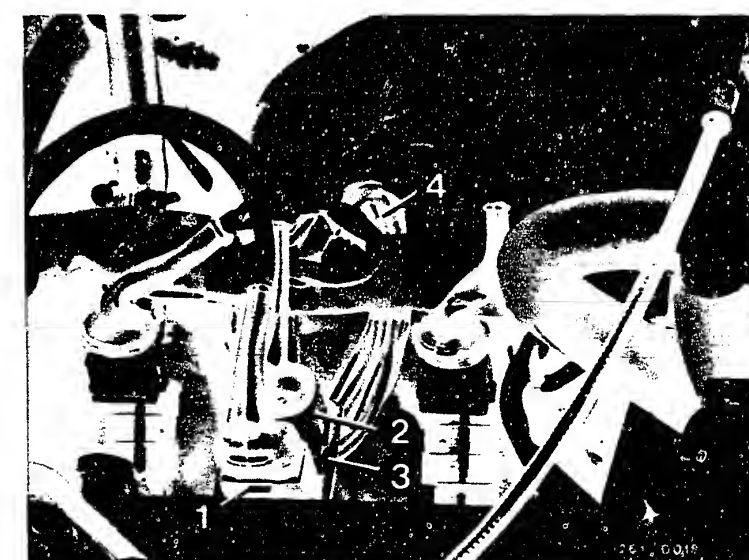


Vehicle up to 8.80 date of manufacture

1 = Ground terminal for 2 ground leads of Motronic

Vehicle as of 8.80 date of manufacture

4 = Central ground for Motronic

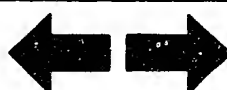


#### Trouble-shooting:

- Check ignition coil and leads 68 and 79.
- Up to 8.1980 date of manufacture: Check engine plug terminal 7 and positive lead to terminal 15.
- Check high-tension cables.
- Check Motronic ground terminal on intake-manifold mounting.
- Continue testing with test step 18.

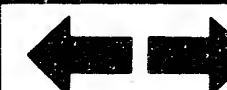
**E7**

Test with test adapter  
BMW 6 and 7 series

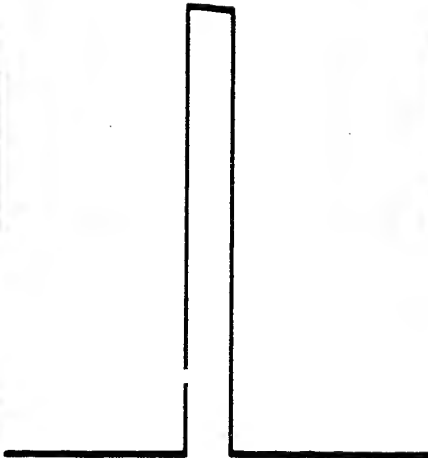


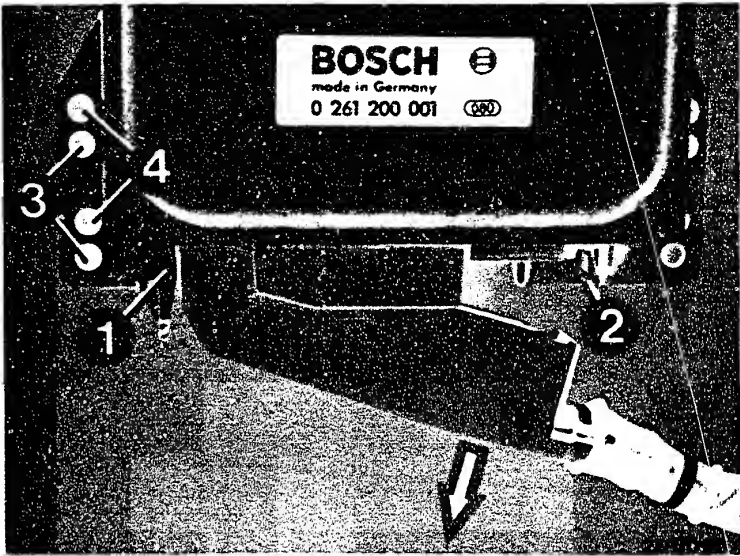
**E8**

Test with test adapter  
BMW 6 and 7 series





Test step 18		Reading	Testing
Operation			
Program selector switch position	17		<u>Component:</u> Control unit
Measuring instrument: Oscilloscope			
Measuring range: Special input			
Test wells: Red clip to red well, black clip to black well.			
Control unit connected, pump relay 1 not plugged in			
Operation in vehicle: Operate starting motor (shift gear to neutral)			<u>Operation:</u> Dwell-period signal at terminal 21 and ground
			<u>Malfunction:</u> No signal

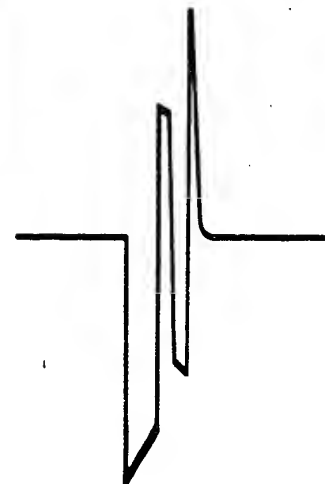


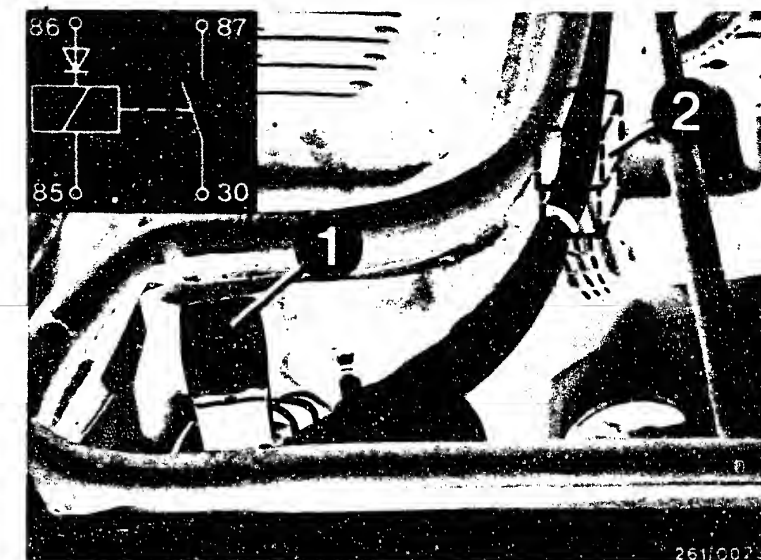
- 1 = Locating lug
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series

Trouble-shooting:  
Replace control unit.

Note  
In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



Test step 19				
Operation			Reading	Testing
Program selector switch position	18			Component: Control unit
Measuring instrument: Oscilloscope				
Measuring range: Special input				
Test wells: Red clip to red well, black clip to black well				Operation: Injection output stage at terminal 15 and ground
Control unit connected, pump relay 1 not plugged in			Malfunction: No signal	
Operation in vehicle: Operate starting motor (shift gear to neutral)				



- 1 = Installation position of relay  
2 up to 8.1980  
2 = Installation position of relay  
2 as of 8.1980

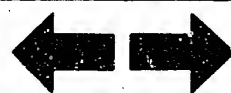
#### Trouble-shooting:

1. Check power supply to injection valves:  
Remove connector from one injection valve and measure voltage to ground at both terminals. In one case battery voltage must be measured. If there is no voltage, check lead 45 to relay 2 terminal 87. Measure voltage at relay 2 terminal 87.

2. Continue with test step 20.

**E11**

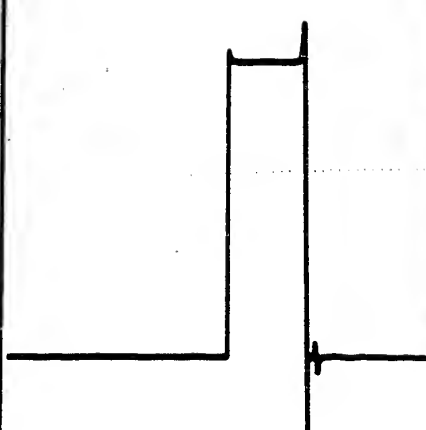
Test with test adapter  
BMW 6 and 7 series

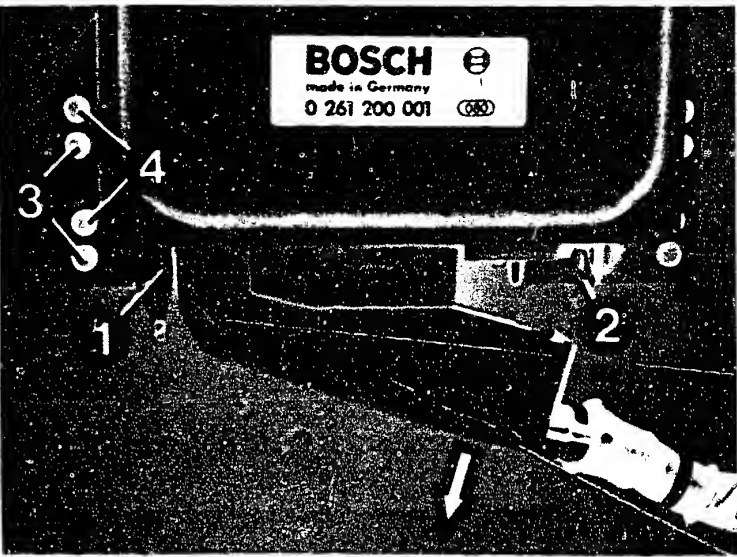


**E12**

Test with test adapter  
BMW 6 and 7 series



Test step 20		Reading	Testing
Operation			
Program selector switch position	19		<u>Component:</u> Control unit
Measuring instrument: Oscilloscope			
Measuring range: Special input			
Test wells: Red clip to red well, black clip to black well.			<u>Operation:</u> Injection signal at terminal 11 and ground
Control unit connected, pump relay 1 <u>not</u> plugged in			<u>Malfunction:</u> No signal
<u>Operation in vehicle:</u> Operate starting motor (shift gear to neutral)			

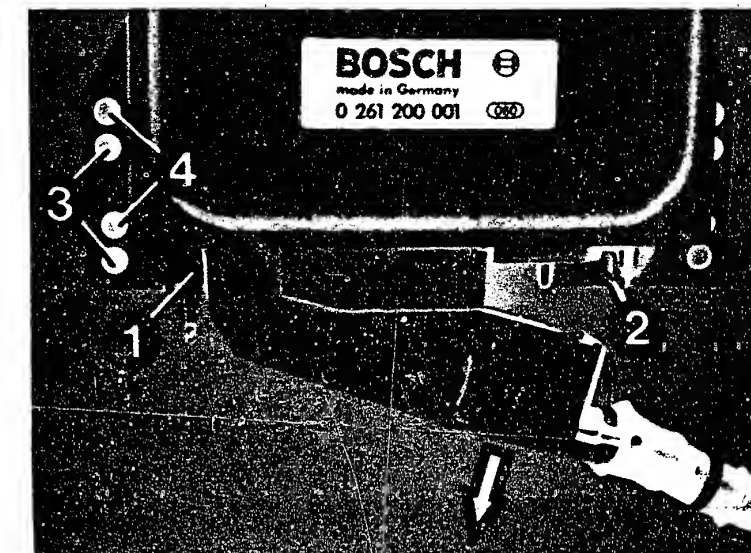


- 1 = Locating lug
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series

Trouble-shooting:  
Replace control unit.

Note  
In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

<u>Test step 21</u>			
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
Program selector switch position	20	<u>Greater than 150 mV</u>	<u>Component:</u> Control unit
Measuring instrument: Voltmeter			
Measuring range: up to 1.5 V			
Test sockets: (red = + black = ground)	V		
Control unit connected, relay 1 not plugged in			
<u>Operation in vehicle:</u> Operate starting motor (shift gear to neutral)			<u>Operation:</u> Injection-signal amplitude at terminal 11 and ground
			<u>Malfunction:</u> Voltage less than 150 mV



- 1 = Locating lug
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series

#### Trouble-shooting:

- Check whether voltmeter (pointer measuring instrument) has  $R_i > 20 \text{ k}\Omega/\text{V}$ .
- Replace control unit.

#### Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

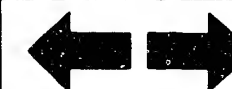
**E 15**

Test with test adapter  
BMW 6 and 7 series

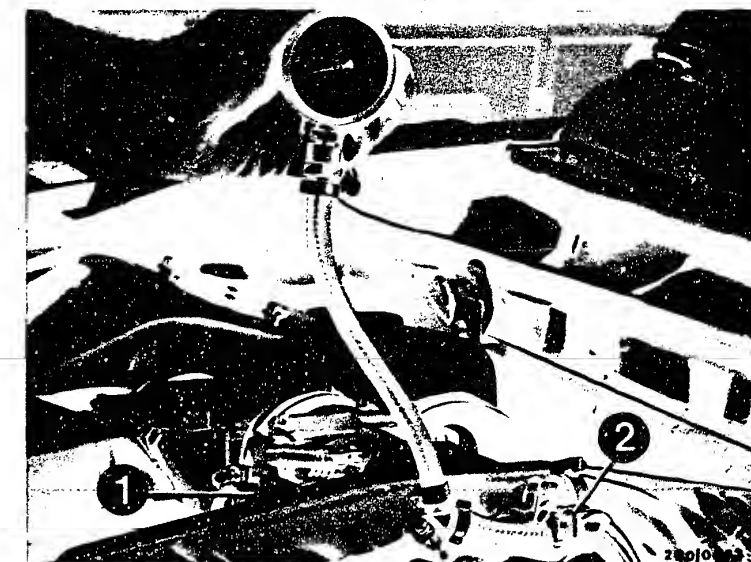


**E 16**

Test with test adapter  
BMW 6 and 7 series

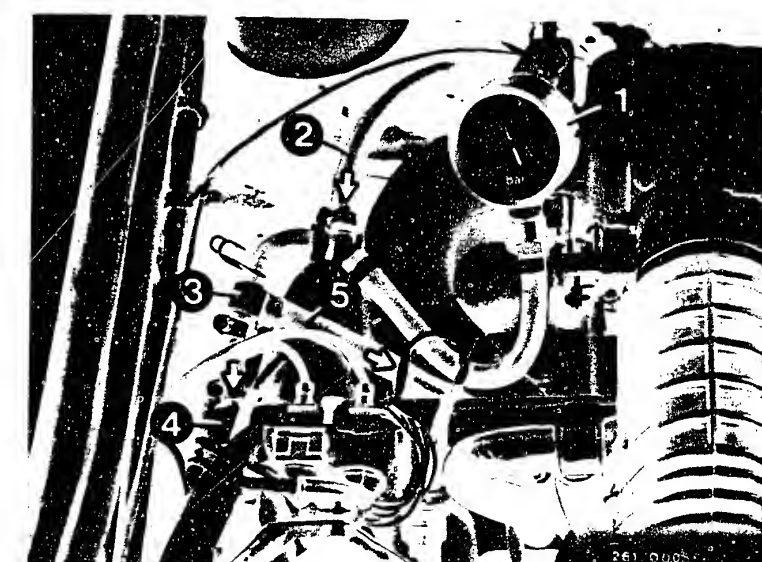


Test step 22 Operation		Reading	Testing
Program selector switch position	21	<u>2.3...2.7 bar</u>	<u>Component:</u> Pump relay, fuel pump, pressure regulator
Measuring instrument: Pressure gauge			
Measuring range: 0 to 6 bar			<u>Operation:</u> Fuel pressure
Measurement on fuel delivery line			
Control unit and <u>pump relay 1</u> plugged in			<u>Malfunction:</u> No fuel pressure or pressure outside tolerance
<u>Operation in vehicle:</u> Switch on ignition		<p><u>Models up to 8.1980 date of manufacture (top picture):</u> Remove hose from start valve (2) and connect pressure gauge. 1 = Vacuum hose to pressure regulator</p> <p><u>Models as of 8.1980 date of manufacture (bottom picture):</u> Install pressure gauge (1) into fuel delivery line (2) on fuel-distribution pipe (4). 5 = Fuel line to start valve. In vehicles without T-piece (3) the start valve is connected to fuel-distribution pipe (4).</p>	



Installation of pressure gauge up to 8.1980 model

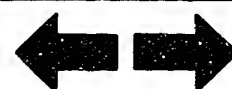
Installation of pressure gauge as of 8.1980 model



Continued on E19/E20

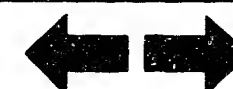
**E17**

Test with test adapter  
BMW 6 and 7 series



**E18**

Test with test adapter  
BMW 6 and 7 series



Test specification reached?

Yes

### Trouble-shooting - test step 22

1. Pressure 0 bar, no pumping noises can be heard:

- Check pump fuse.
- Replace pump relay 1.
- Check leads 64 and 70 from relay 1 to engine plug term. 9/term. 8.
- Measure voltage at disconnected pump plug.
- No voltage present: Check lead from fuel pump to engine plug term. 9 as well as pump ground lead.
- Voltage present: Check pressure regulator and fuel pump, as described below under 2.

2. Pressure outside tolerance, fuel pump operating:

- Fuel pressure too low:  
Slowly pinch off return line with hose clammer.  
Pressure rises above 4 bar → replace pressure regulator.  
Pressure remains below 4 bar → replace fuel pump.

Continued on E21/E22



1 = Pump relay (installation position up to 8.1980 date of manufacture)

2 = Fuse (16 A) for electric fuel pump

3 = Pump relay (installation position as of 8.1980 date of manufacture)

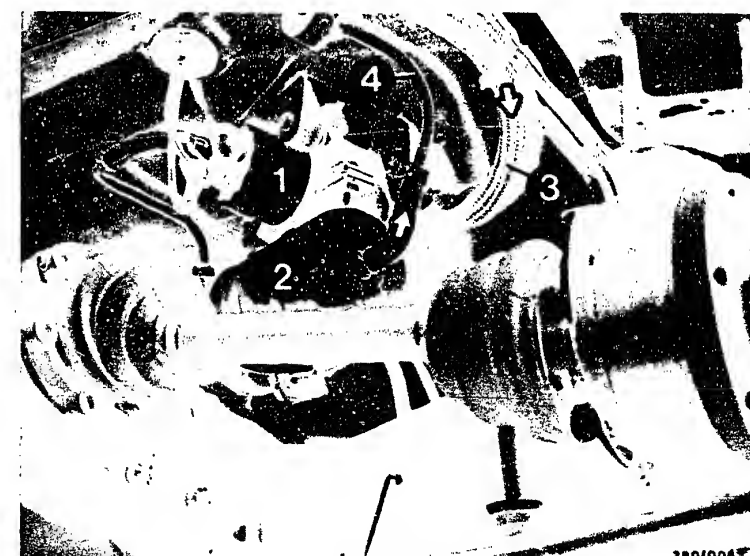
1 = Fuel pump

2 = Fuel filter

3 = Fuel intake line

4 = Fuel delivery line

Arrow = Direction of fuel flow



**E19**

Test with test adapter  
BMW 6 and 7 series



**E20**

Test with test adapter  
BMW 6 and 7 series

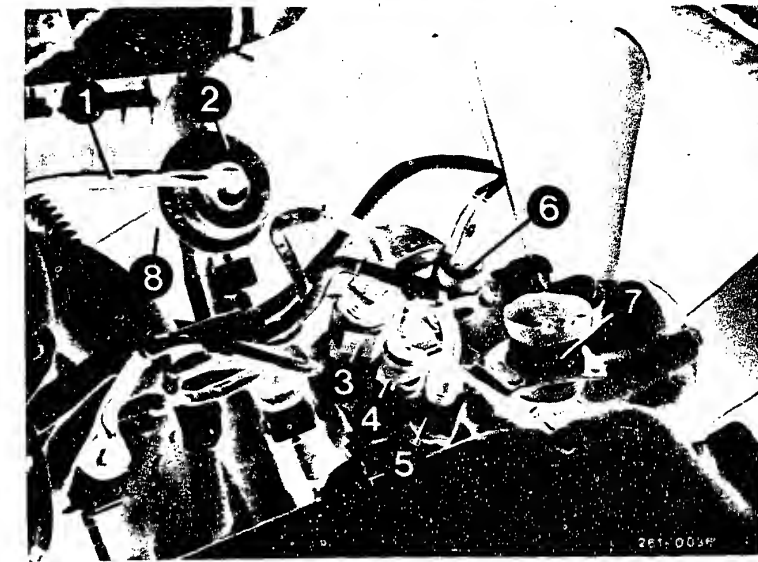




### Trouble-shooting - test step 22

(continued)

- Check fuel line and fuel filter for through-flow. Fuel lines pinched?
  - Strainer in tank clogged?
  - Corrosion in tank?
3. Fuel pressure above 2.7 bar:
- Fuel return line clogged or pinched.
  - Replace pressure regulator.



- 1 = Air hose to intake manifold  
2 = Pressure regulator, screwed onto fuel-distribution pipe  
3 = Thermo-time switch, brown plug  
4 = Temperature sensor for temperature indication in instrument panel  
5 = Engine temperature sensor (NTC II in coolant), white plug  
6 = Water-level sensor for fault indication (check control)  
7 = Diagnostic socket  
8 = Fuel return line

Yes

Continued on E23/E24

**E21**

Test with test adapter  
BMW 6 and 7 series



**E22**

Test with test adapter  
BMW 6 and 7 series





<u>Test step 23</u>			
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
Program selector switch position	22	<u>10...15 V</u>	<u>Component:</u> Control unit, pump relay 1
Measuring instrument: Voltmeter			<u>Operation:</u> Pump control passive at terminal 20 and ground.
Measuring range: up to 15 V			
Test sockets (red = + black = ground)	V		
Control unit and pump relay 1 plugged in			<u>Malfunction:</u> No voltage or voltage too low
<u>Operation in vehicle:</u> Switch on ignition			



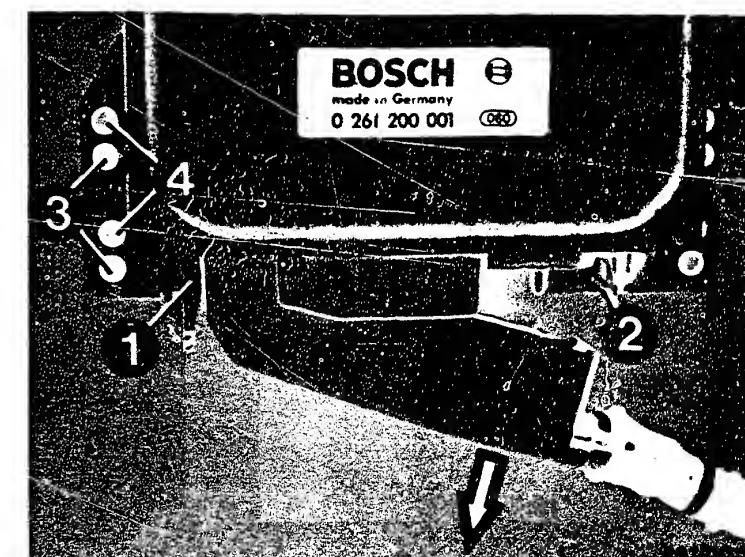
- 1 = Pump relay (installation position up to 8.1980 date of manufacture)  
2 = Fuse (16 A) for electric fuel pump  
3 = Pump relay (installation position as of 8.1980 date of manufacture)  
1 = Locating lug  
2 = Detent  
3 = Mounting holes - 6 series  
4 = Mounting holes - 7 series

#### Trouble-shooting:

- Check pump relay 1 (coil winding).
- Check leads 20 and 46 including plug-in connectors.
- Replace control unit.

#### Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



**E 23**

Test with test adapter  
BMW 6 and 7 series

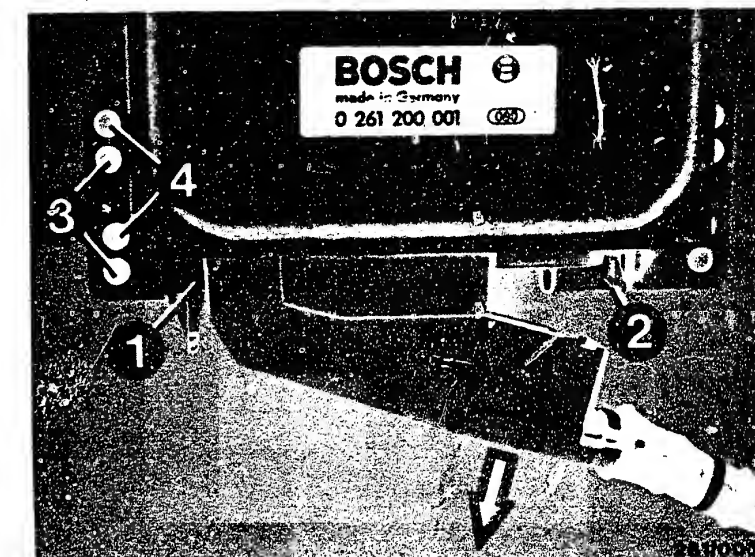


**E 24**

Test with test adapter  
BMW 6 and 7 series



Test step 24		Reading	Testing
Operation			
Program selector switch position	22	max. 4.0 V	Component: Control unit
Measuring instrument: Voltmeter			Operation: Pump control active at terminal 20 and ground
Measuring range: up to 15 V			
Test sockets: (red = + black = ground)	V		
Control unit and pump relay 1 plugged in			Malfunction: Voltage 0 V or greater than 4 V
Operation in vehicle: Operate starting motor (shift gear to neutral, engine may start)			



- 1 = Locating lug
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series

#### Trouble-shooting:

Replace control unit.

#### Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

**F1**

Test with test adapter  
BMW 6 and 7 series



**F2**

Test with test adapter  
BMW 6 and 7 series



# CAUTION!

The following test steps can only be performed with the engine running.  
If the engine will not run, continue with the trouble-shooting program of your choice.  
Detailed trouble-shooting - see B3 - B4  
Direct trouble-shooting - see B5 - B10  
For further trouble-shooting, leave the test adapter, control unit and pressure gauge connected.

## Test step 25

Operation		Reading	Testing
Program selector switch position	17	<u>850...950 min<sup>-1</sup></u>  <u>0.3...1.5% CO</u>  Press red button NTC II:  Values unchanged	<u>Component:</u> Engine
Measuring instrument: Motortester and CO analyzer			
Measuring range: Engine speed and CO			
Measurement at ignition coil: Green clip to terminal 1, yellow clip to terminal 15			
Control unit and pump relay 1 plugged in			
Operation in vehicle: Let engine run			<u>Operation:</u> Idle speed and exhaust gas
			<u>Malfunction:</u> Values outside tolerance

For trouble-shooting see F5/F6

**F3**

Test with test adapter  
BMW 6 and 7 series



**F4**

Test with test adapter  
BMW 6 and 7 series



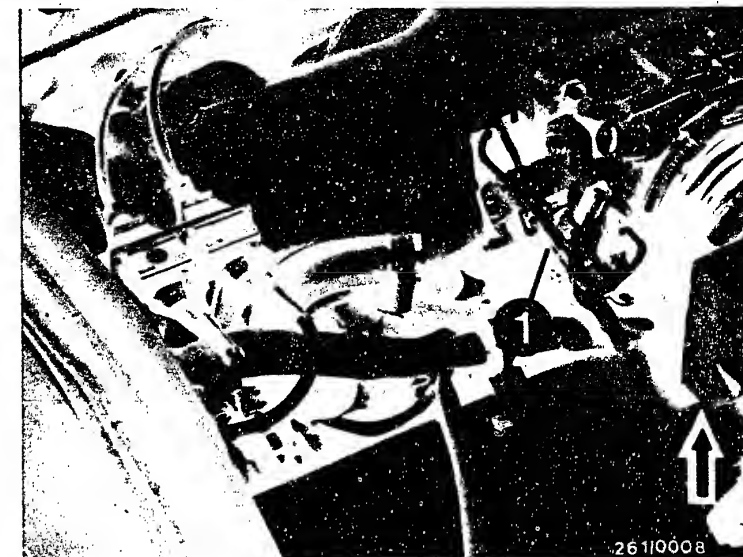
### Trouble-shooting - test step 25

- Adjust idle speed at idle-speed adjusting screw.
- Adjust exhaust gas (CO) at bypass screw in air-flow sensor:  
Plug in air-flow sensor in models up to 8.1980 made of plastic; in models as of 8.1980 with inlaid steel plates. Remove the steel plate by drilling out.  
Use a short screwdriver for adjusting.  
After finishing the CO adjustment, use new plug (red).

Exhaust-gas value below 0.3 % by vol. CO and not adjustable:

Check the air intake and exhaust system for leaks (unmetered air) (pressure test).

If, after pressing red button NTC II, the readings change, bring the engine to normal operating temperature.



Vehicle up to 8.1980 date of manufacture:

Arrow = CO adjustment

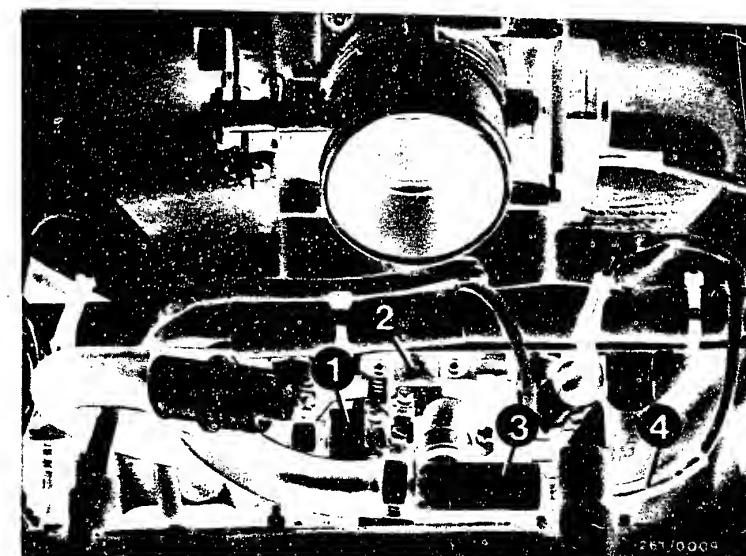
1 = Idle-speed adjusting screw

Vehicle as of 8.1980 date of manufacture:

1 = Auxiliary-air device

2 = Start valve

3 = Idle-air adjusting screw



**F5**

Test with test adapter

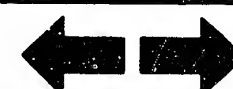
BMW 6 and 7 series



**F6**

Test with test adapter

BMW 6 and 7 series



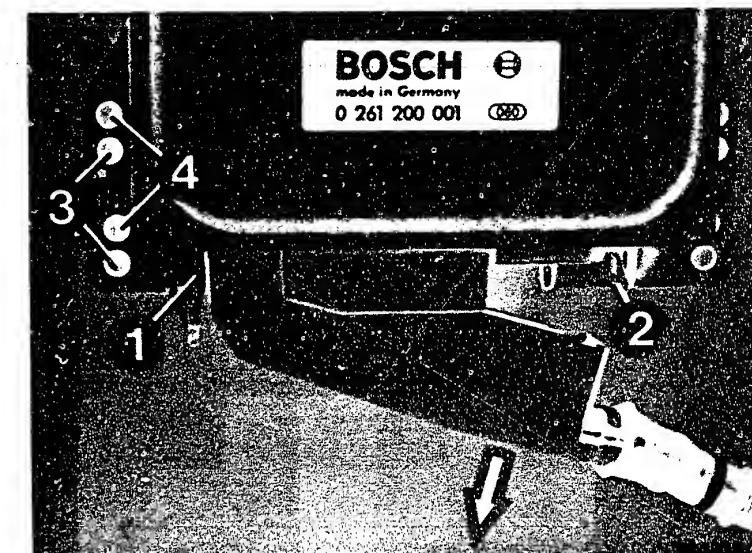
Test step 26			
Operation		Reading	Testing
Program selector switch position	17	Engine at normal operating temperature. Idle speed: <u>-2°...+3° crankshaft</u>	<u>Component:</u> Control unit
Measuring instrument: Motortester			
Measuring range: Spark advance		Press grey button NTC II: Engine hunts <u>3°...8° crankshaft</u>	
Connect adapter cable for BMW to diagnostic socket		Press grey button NTC I and button VL: Engine speed increases (to approx. 1500 min <sup>-1</sup> ) <u>20°...25° crankshaft</u>	<u>Operation:</u> Spark advance
Control unit and pump relay 1 plugged in			<u>Malfunction:</u> Spark advance outside tolerance
<u>Operation in vehicle:</u> Let engine run			

#### Trouble-shooting:

- Check idle speed again precisely.
- Replace control unit

#### Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Locating lug
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series

**F7**

Test with test adapter  
BMW 6 and 7 series



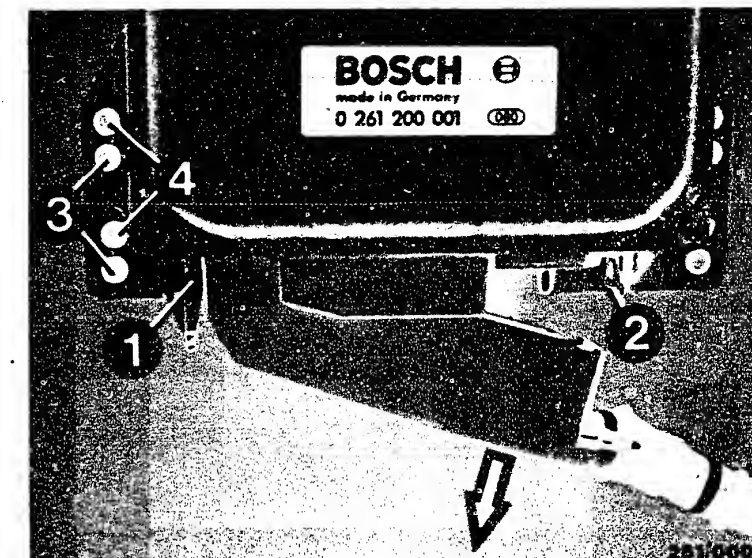
**F8**

Test with test adapter  
BMW 6 and 7 series





Test step 27			
Operation		Reading	Testing
Program selector switch position	17	Engine at normal operating temperature, idle speed:  <u>6°...18°</u>  At 3000 min <sup>-1</sup> :  <u>22°...42°</u>	<u>Component:</u> Control unit
Measuring instrument: Motortester			
Measuring range: Dwell angle			
Measurement on ignition coil: Green clip to terminal 1, yellow clip to terminal 15			
Control unit and pump relay 1 plugged in			
<u>Operation in vehicle:</u> Let engine run			<u>Malfunction:</u> Dwell angle outside tolerance



- 1 = Locating lig
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series

### Trouble-shooting:

Replace control unit

### Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

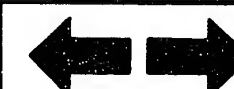
**F9**

Test with test adapter  
BMW 6 and 7 series

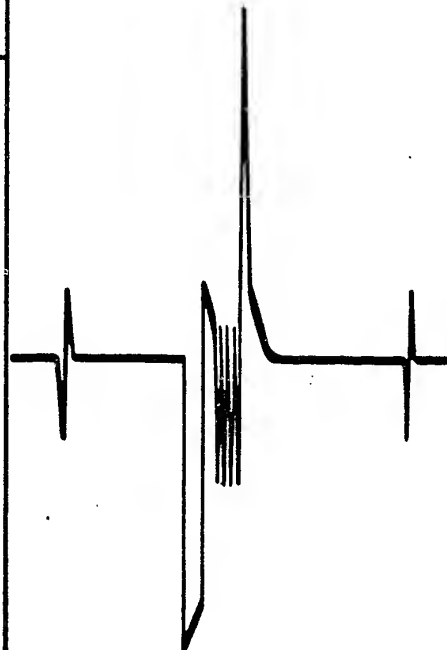


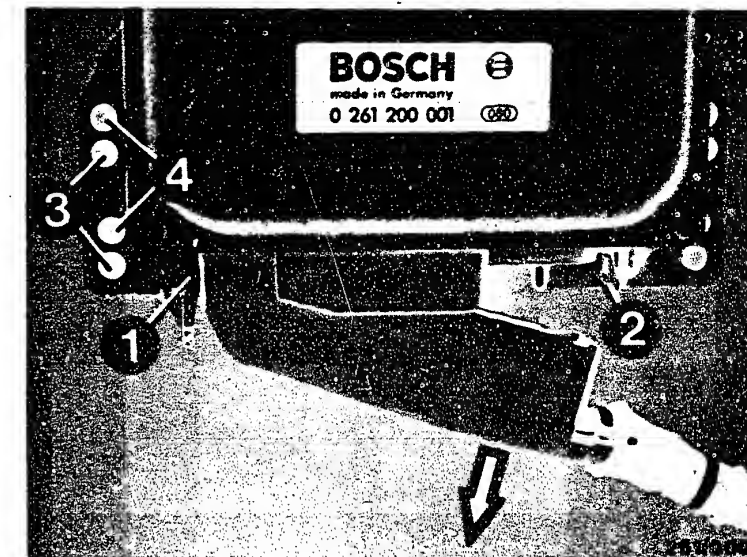
**F10**

Test with test adapter  
BMW 6 and 7 series





Test step 28		Reading	Testing
Operation			
Program selector switch position	18	1. Signal present (see below)  2. Press grey button NTC II: Signal becomes noticeably wider.  3. Press grey buttons NTC II and NTC I: Signal becomes <u>slightly</u> wider than in 2.	Component: Control unit
Measuring instrument: Oscilloscope			
Measuring range: Special input			
Test wells: Red clip to red well, black clip to black well.			Operation: Influence of temperature on duration of injection. Measured at terminal 15 and ground.
Control unit and pump relay 1 plugged in			Malfunction: No influence on signal width
Operation in vehicle: Let engine run			
Trouble-shooting: Replace control unit			Note In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

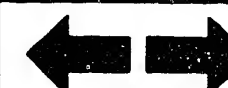


- 1 = Locating lug
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series

**F11**

 Test with test adapter  
BMW 6 and 7 series

**F12**

 Test with test adapter  
BMW 6 and 7 series


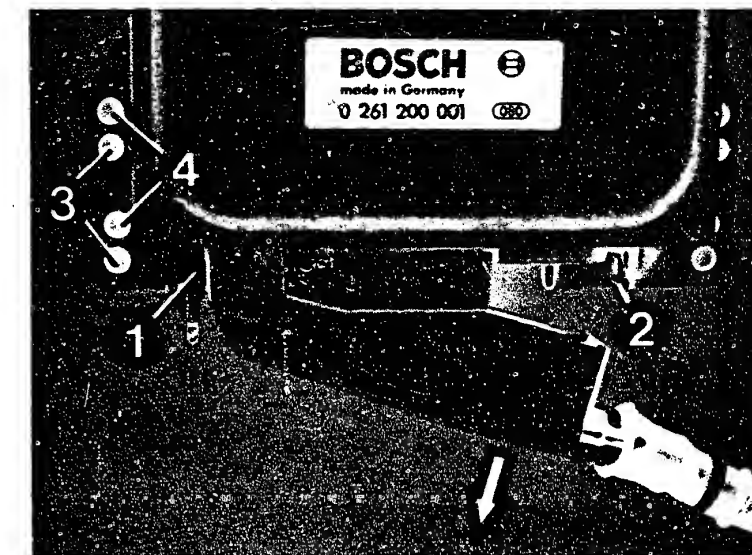
Test step 29		Reading	Testing
Operation			
Program selector switch position	19	Engine at normal operating temperature, engine speed 2000 min <sup>-1</sup> (retain throttle position) Press button LL:  Engine "hunts" i.e. signal no longer visible. Engine speed drops to approx. 1200 min <sup>-1</sup> . Signals then start again and engine speed rises again until signals are suppressed again etc.	Component: Control unit
Measuring instrument: Oscilloscope			
Measuring range: Special input			
Test wells: Red clip to red well, black clip to black well.			
Control unit and pump relay 1 plugged in			
Operation in vehicle: Let engine run			Operation: Cutoff of injection pulses at terminal 11 and ground
			Malfunction: No cutoff

#### Trouble-shooting:

Replace control unit

#### Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Locating lug
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series

**F13**

Test with test adapter  
BMW 6 and 7 series



**F14**

Test with test adapter  
BMW 6 and 7 series



<u>Test step 30</u>		Drive vehicle onto chassis dynamometer, tyre pressure 3 bar, engine at normal operating temperature	
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
Program selector switch position	20	On chassis dynamometer with adjustable load (e.g. LPS 96): <u>1. Manually-shifted transmission</u> <u>0.2...0.6 V</u> at idle <u>1.0...1.4 V</u> at 50 km/h, 2000 N and approx. 1500 min <sup>-1</sup> to 2000 min <sup>-1</sup> <u>0.7...1.1 V</u> at 65 km/h, 770 N and approx. 2000 min <sup>-1</sup> to 2600 min <sup>-1</sup>	<u>Component:</u> Control unit
Measuring instrument: Voltmeter			<u>Operation:</u> Control unit, injection-signal amplitude under load
Measuring range: 3 V/10 V			
Test sockets (red = + black = ground)	V		
Control unit and pump relay 1 plugged in			<u>Malfunction:</u> Reading not inside tolerance
<u>Operation in vehicle:</u> Let engine run			
<u>2. Automatic transmission:</u>		<u>0.2...0.6 V</u> at idle, drive mode N <u>1.0...1.4 V</u> at 50 km/h, 1500 N, approx. 1900 min <sup>-1</sup> , drive mode D <u>2.4...2.9 V</u> at 50 km/h, 4500 N, approx. 3700 min <sup>-1</sup> , drive mode 1	
<u>3. Test on LPS 002:</u>		(Load not adjustable), with manually-shifted transmission shift through gears 1 to 4, with automatic transmission select drive mode D. Reading greater than 2.8 V at 100 km/h, fully depress accelerator immediately, but do not trigger the kick-down.	
<u>Trouble-shooting:</u> 1. Repeat test. 2. Replace control unit.			



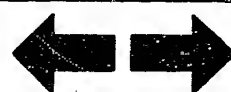
- 1 = Locating lug
- 2 = Detent
- 3 = Mounting holes - 6 series
- 4 = Mounting holes - 7 series

#### Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

**F15**

Test with test adapter  
BMW 6 and 7 series



**F16**

Test with test adapter  
BMW 6 and 7 series



Testing with the Motronic adapter is now completed.  
If the fault has not been found or if you require  
further information and instructions on how to remedy  
the fault, continue with the trouble-shooting program  
of your choice.

Detailed trouble-shooting → see B3-B4

Direct trouble-shooting → see B5-B10

**F17**

Test with test adapter

BMW 6 and 7 series



## 10. Trouble-shooting program according to customer complaints

### How to use the following trouble-shooting program

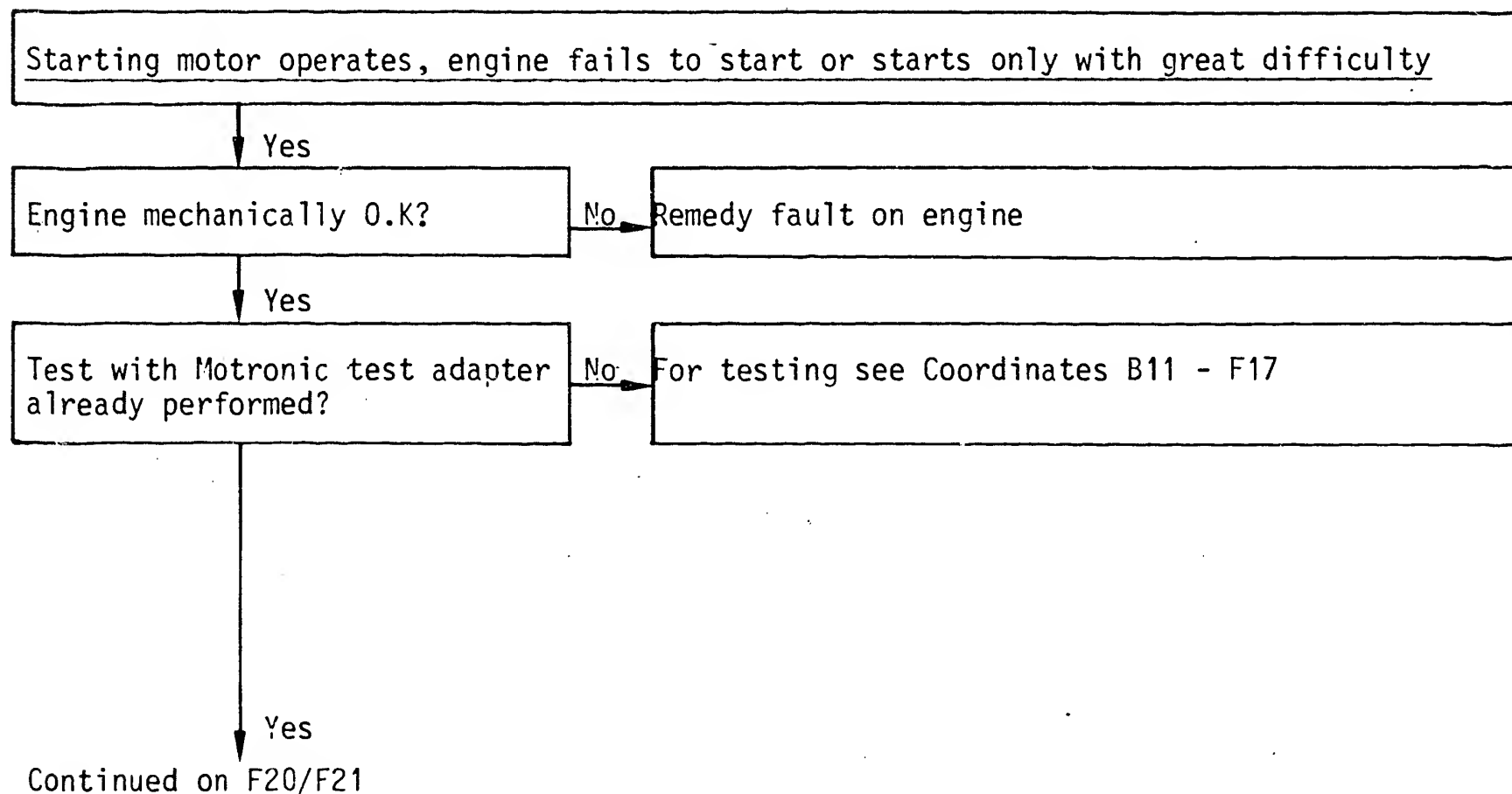
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



**F18**

Engine fails to start  
BMW 6 and 7 series



**F19**

Engine fails to start  
BMW 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

No

Check ignition coil and high-voltage section: Distributor cap oil-fouled inside and outside? (Remove distributor rotor and check camshaft seal).  
Note: Distributor cap is fastened by 3 screws. When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx.  $0\ \Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, H.T. ignition cables and spark plugs.

Yes

While cranking, feel all injection valves by hand. Can needle movement be felt on all valves?

No

Test injection valve with ohmmeter. Test specification: 2 to 3  $\Omega$ . Replace injection valve if defective.

Yes

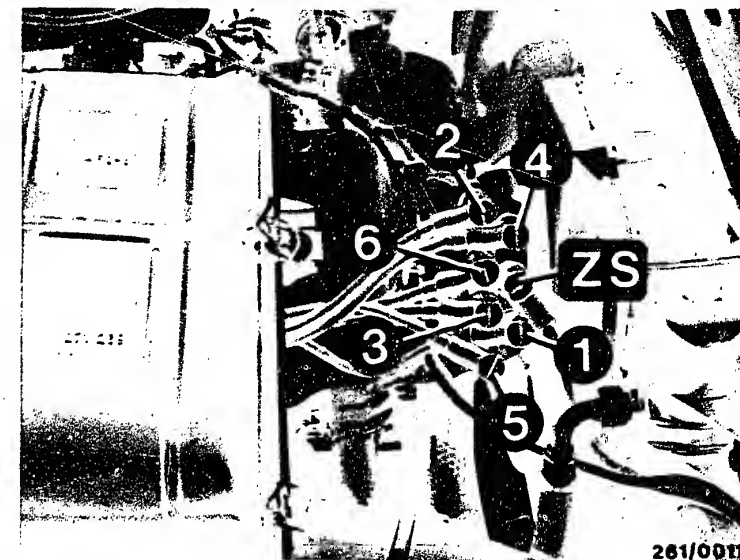
Thermo-time switch tested?

No

Test thermo-time switch 35°C, 8 sec. Remove plug and make direct resistance measurement at thermo-time switch. In vehicles up to 8.80 date of manufacture, connect test lead KDJE 7450/70 to the thermo-time switch to make the measurement.

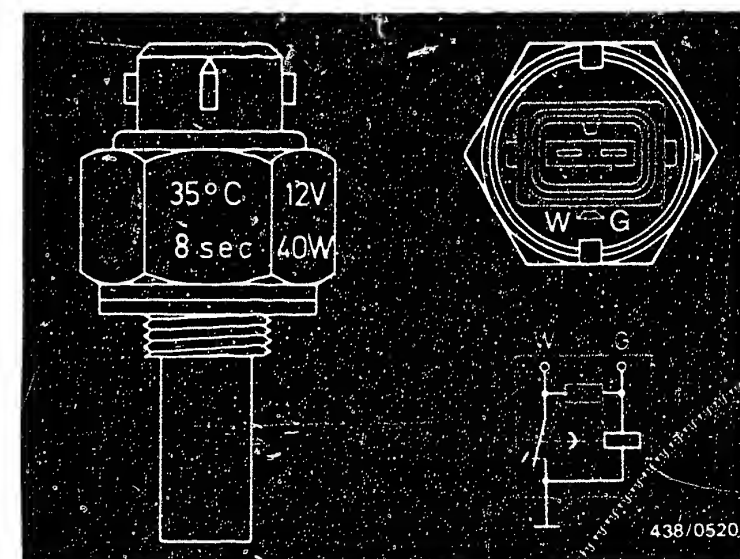
- Between term. G and ground (housing)  
below + 30°C: 25...40  $\Omega$   
above + 40°C: 50...80  $\Omega$
- Between term. W and ground (housing)  
below + 30°C: 0  $\Omega$   
above + 40°C: 100...160  $\Omega$
- Between term. G and W  
below + 30°C: 25...40  $\Omega$   
above + 40°C: 50...80  $\Omega$

Continued on F22/F23



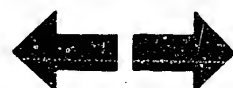
High-voltage distributor  
1 to 6 = Cylinder numbers  
ZS = High-tension cable to ignition coil

Thermo-time switch



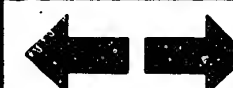
**F20**

Engine fails to start  
BMW 6 and 7 series



**F21**

Engine fails to start  
BMW 6 and 7 series





Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Yes

Start valve tested?  
(Leaks)

No

### Start valve

#### Functional test:

Check the power supply to the start valve when starting. To do this, remove the plug from the start valve and connect voltmeter to the start valve plug.

1. Coolant temperature below + 30°C:  
Voltage reading greater than 6 V
2. Coolant temperature above + 40°C:  
No voltage reading

Check the following leads for continuity using ohm-meter (approx. 0  $\Omega$ ):

- Lead 73 to thermo-time switch term. W (73)
- Leads 74 and 76 to starting motor term. 50
- Lead from starting motor term. 50 to thermo-time switch term. G (75)

#### Electrical test of start valve:

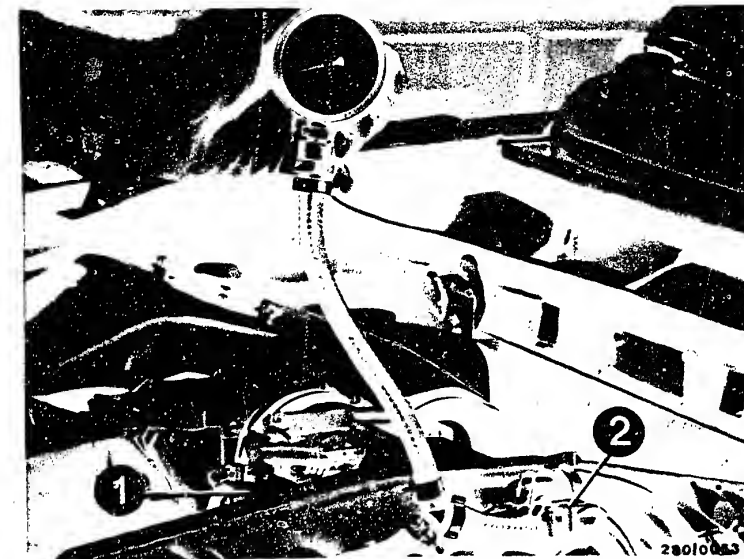
Resistance approx. 4  $\Omega$ .

#### Mechanical test of start valve:

Remove start valve from intake manifold and hold in a container (caution! fire hazard!). When starting at temperatures below + 30°C the start valve must squirt (max. 8 seconds). At above + 40°C the valve must not squirt. With the ignition switched on and the pressure built up, the valve must likewise not squirt. Carry out squirt test for above 40°C as follows: Remove plug from thermo-time switch and ground term. W.

Yes

Continued on G1/G2

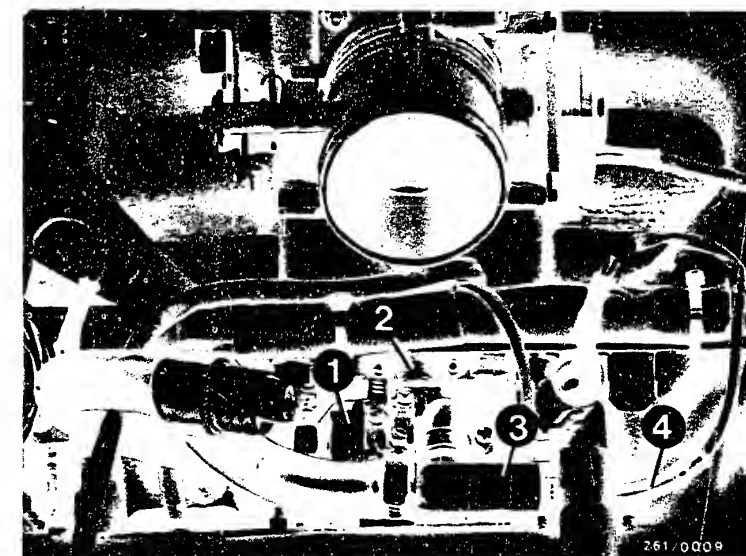


Vehicles up to 8.80 date of manufacture

- 1 = Vacuum hose
- 2 = Start valve

Vehicles as of 8.80 date of manufacture

- 1 = Auxiliary-air device
- 2 = Start valve
- 3 = Idle-air adjusting screw
- 4 = Electric connection of auxiliary-air device



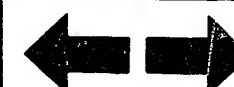
**F22**

Engine fails to start  
BMW 6 and 7 series



**F23**

Engine fails to start  
BMW 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Yes

Start valve O.K.?  
(Continued)

Testing the start valve for leaks:

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

2. When removed:

Remove the start valve (caution! fire hazard!). Fuel line and electric lead remain connected. (Place collector vessel under the start valve). Build up the fuel pressure.

Test specification: Within one minute max.  
1 drop may form at the mouth of the valve.

Yes

Models up to 8.80 only:  
Ground lead between auxiliary-  
air device and ram pipe  
checked?

No

- Make sure that connection points of ground lead are bare down to the metal and are firmly secured.
- Replace lead and connect correctly.

Yes

Continued on G3/G4

**G1**

Engine fails to start



**G2**

Engine fails to start  
BMW 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Yes

Auxiliary-air device tested?

No

Testing (mechanical):

1. Visual examination of auxiliary-air device:

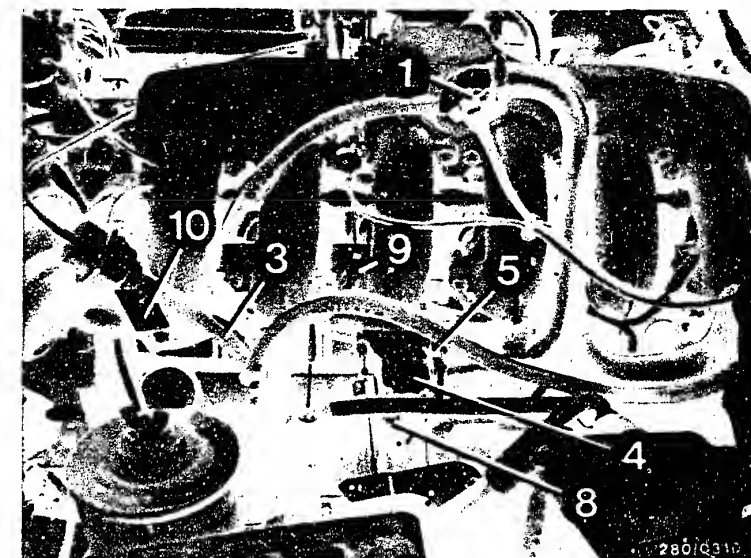
Remove hoses and look down, using a small mirror. In vehicles up to 8.80 date of manufacture blow air through. When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:

With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

Yes

Continued on G5/G6



Up to 8.80 date of manufacture

1 = Start valve

4 = Auxiliary-air device

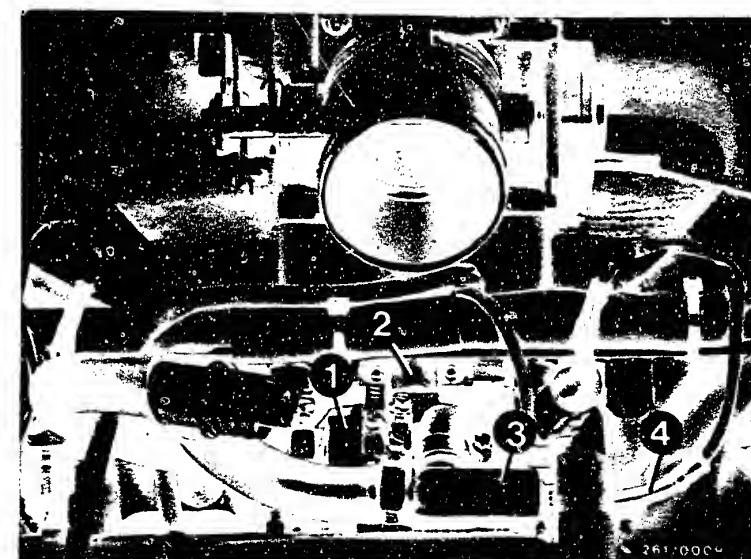
As of 8.80 date of manufacture

1 = Auxiliary-air device

2 = Start valve

3 = Idle-air adjusting screw

4 = Electric connection of  
auxiliary-air device



G3

Engine fails to start  
BMW 6 and 7 series



G4

Engine fails to start  
BMW 6 and 7 series.



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Yes

As of 8.80 date of manufacture  
only:  
Auxiliary-air device tested?  
(Continued)

No

Testing (electrical - as of 8.80 date of manu-  
facture)

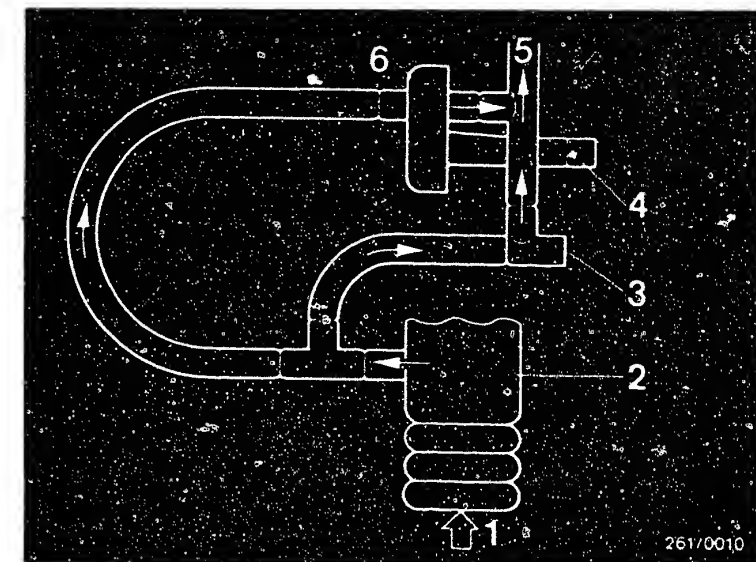
Remove plug from auxiliary-air device. Con-  
nect ohmmeter to both terminals of auxiliary-  
air device:

Test specification: 40...75  $\Omega$ .

If the reading is outside tolerance, replace  
auxiliary-air device.

Yes

Continued on G7/G8



- 1 = From air-flow sensor
  - 2 = Hose piece between air-flow  
sensor and throttle-valve  
assembly
  - 3 = Idle-air adjusting screw
  - 4 = Electric connection of  
auxiliary-air device
  - 5 = Bypass air to intake manifold  
(connection under start valve)
  - 6 = Auxiliary-air device
- Hose diagram for idle air and  
auxiliary-air device as of 8.1980  
date of manufacture

**G5**

Engine fails to start  
BMW 6 and 7 series



**G6**

Engine fails to start  
BMW 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Yes

Air-flow sensor mechanically  
O.K.?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Yes

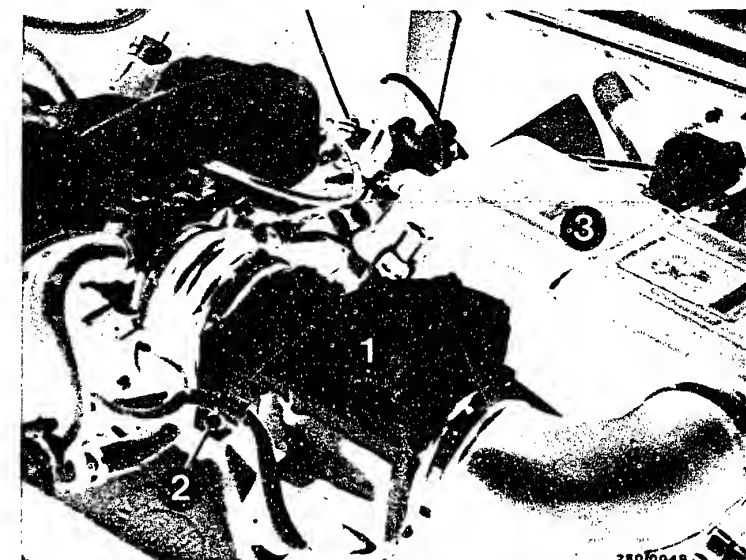
Are all hose lines and electric  
leads securely attached?  
Visual examination.  
Is the air-intake system leak-  
tight?

No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.  
Checking for leaks: Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection.

Yes

Continued on G9/G10



- 1 = Air-flow sensor
- 2 = Bypass screw  
(Turning in a clockwise  
direction = lower CO con-  
centration)
- 3 = Air filter

**G7**

Engine fails to start  
BMW 6 and 7 series



**G8**

Engine fails to start  
BMW 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Yes

Testing completed for customer complaint

"Starting motor operates, engine fails to start or starts only with great difficulty",

Customer complaint remedied?

No

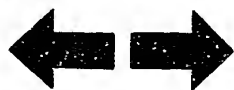
Further possibilities

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10). If the fault has not be detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).

**G9**

Engine fails to start

BMW 6 and 7 series



**G10**

Engine fails to start

BMW 6 and 7 series





## Trouble-shooting program according to customer complaints

### How to use the following trouble-shooting program

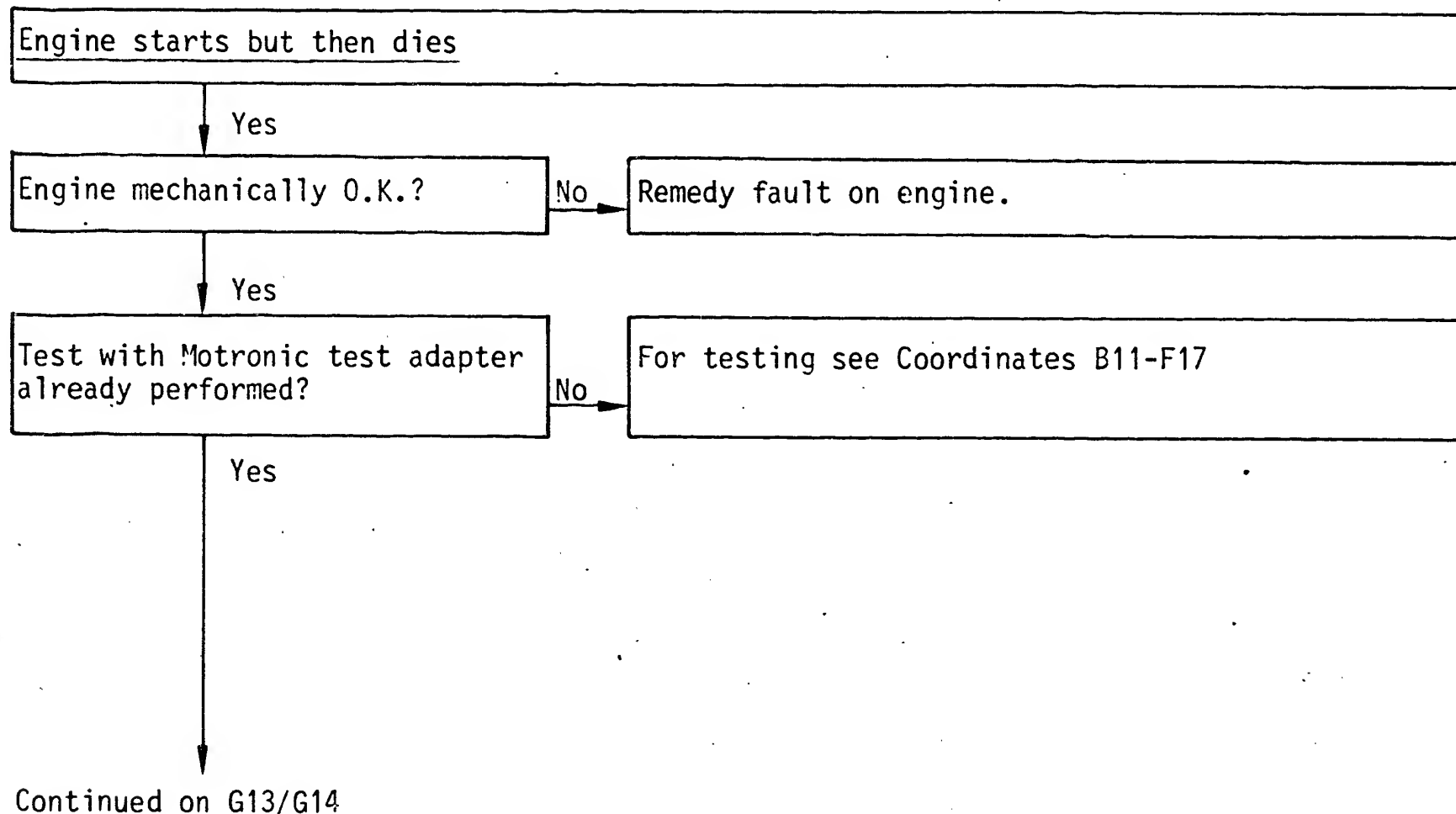
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



**G11**

Engine starts but then dies  
BMW 6 and 7 series



**G12**

Engine starts but then dies  
BMW 6 and 7 series



Engine starts but then dies (continued)

Yes

Are all hose lines and electric leads securely attached?  
Visual examination.  
Is the air-intake system leak-tight?

No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.  
Checking for leaks: Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection.

Yes

Continued on G15/G16

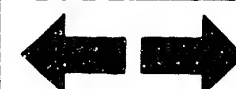
**G13**

Engine starts but then dies  
BMW 6 and 7 series



**G14**

Engine starts but then dies  
BMW 6 and 7 series



Engine starts but then dies (continued)

Yes

Thermo-time switch tested?

No

Test thermo-time switch 35°C, 8 sec.  
Remove plug and make direct resistance  
measurement at thermo-time switch.

1. Between term. G and ground

(Housing):

below + 30°C: 25...40  $\Omega$

above + 40°C: 50...80  $\Omega$

2. Between term. W and ground

(Housing):

below + 30°C: 0  $\Omega$

above + 40°C: 100...160  $\Omega$

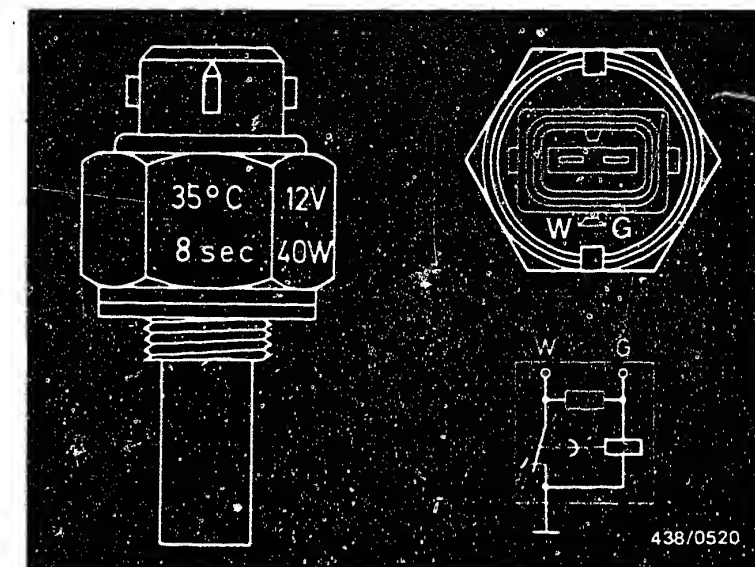
3. Between term. G and W

below + 30°C: 25...40  $\Omega$

above + 40°C: 50...80  $\Omega$

Yes

Continued on G17/G18



Thermo-time switch

**G15**

Engine starts but then dies  
BMW 6 and 7 series



**G16**

Engine starts but then dies  
BMW 6 and 7 series



## Engine starts but then dies (continued)

Yes

Start valve tested?  
(Leaks)

No

### Start valve

#### Functional test:

Check the power supply to the start valve when starting. To do this, remove the plug from the start valve and connect voltmeter to the start valve plug.

1. Coolant temperature below + 30°C:  
Voltage reading greater than 6 V
2. Coolant temperature above + 40°C:  
No voltage reading

Check the following leads for continuity using ohmmeter

(approx. 0  $\Omega$ ):

- Lead 73 to thermo-time switch term. W (73)
- Lead 76 to starting motor term. 50
- Lead from starting motor term. 50 to thermo-time switch term. G (75)

#### Electrical test of start valve:

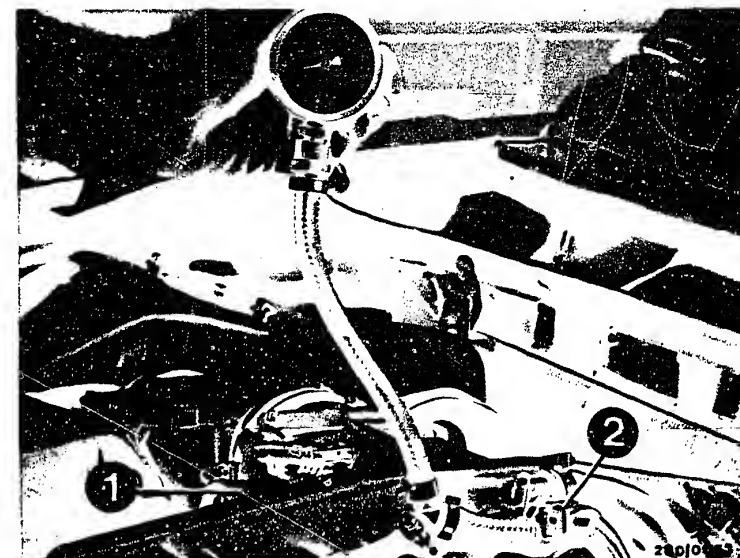
Resistance approx. 4  $\Omega$ .

#### Mechanical test of start valve:

Remove start valve from intake manifold and hold in a container (caution! fire hazard!). When starting at temperatures below + 30°C the start valve must squirt (max. 8 seconds). At above + 40°C the valve must not squirt. With the ignition switched on and the pressure built up, the valve must likewise not squirt. Carry out squirt test for above 40°C as follows:

Remove plug from thermo-time switch and ground term. W.

Yes

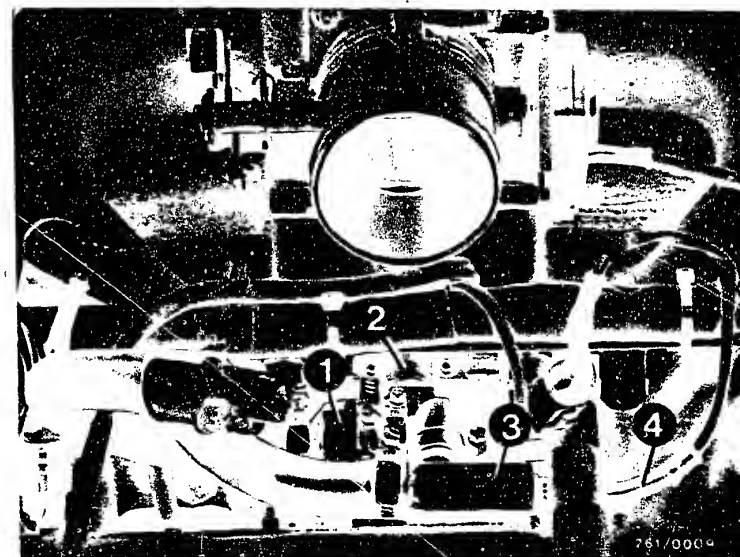


Vehicles up to 8.80 date of manufacture

- 1 = Vacuum hose
- 2 = Start valve

Vehicles as of 8.80 date of manufacture

- 1 = Auxiliary-air device
- 2 = Start valve
- 3 = Idle-air adjusting screw
- 4 = Electric connection of auxiliary-air device



Continued on G19/G20

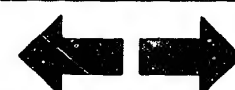
**G17**

Engine starts but then dies  
BMW 6 and 7 series



**G18**

Engine starts but then dies  
BMW 6 and 7 series



## Engine starts but then dies (continued)

Yes

Start valve O.K.?  
(Continued)

No

### Testing the start valve for leaks:

#### 1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

#### 2. When removed:

Remove the start valve (caution! fire hazard!). Fuel line and electric lead remain connected. (Place collector vessel under the start valve). Build up the fuel pressure.

Test specification: Within one minute max.

1 drop may form at the mouth of the valve.

Yes

Air-flow sensor O.K.?

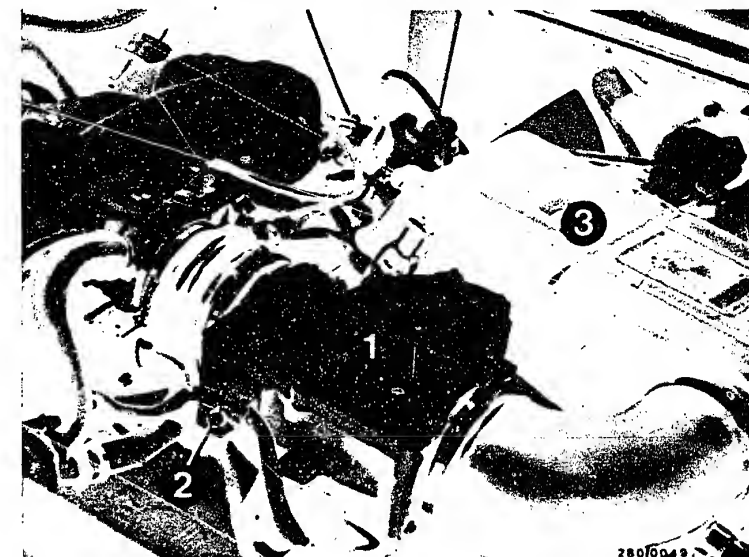
No

### Testing:

Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Yes

Continued on G21/G22



1 = Air-flow sensor

2 = Bypass screw

(Turning in a clockwise direction = lower CO concentration)

3 = Air filter

**G19**

Engine starts but then dies  
BMW 6 and 7 series



**G20**

Engine starts but then dies  
BMW 6 and 7 series



Engine starts but then dies (continued)

Yes

Auxiliary-air device  
tested?

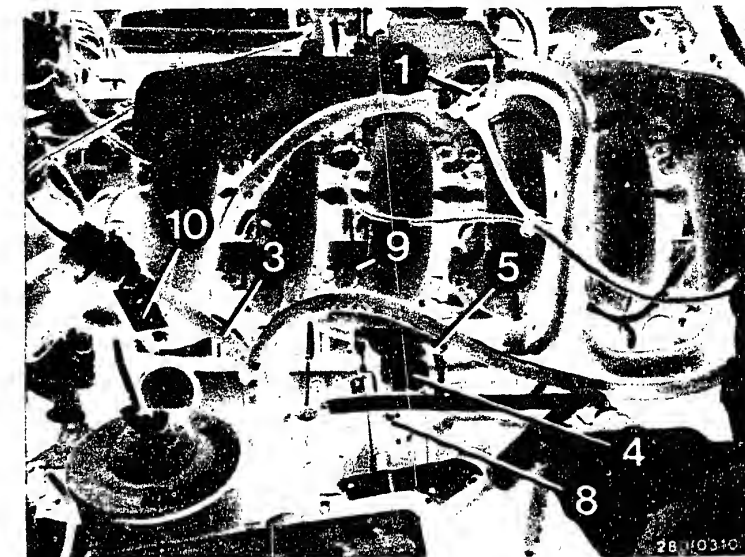
No

Testing (mechanical):

1. Visual examination of auxiliary-air device:  
Remove hoses and look down, using a small  
mirror. In vehicles up to 8.80 date of  
manufacture blow air through.  
When cold, the device must be open; when the  
engine is warm, it must be closed. If not,  
replace auxiliary-air device.

Yes

Continued on G23/G24



Up to 8.80 date of manufacture

1 = Start valve

2 = Auxiliary-air device

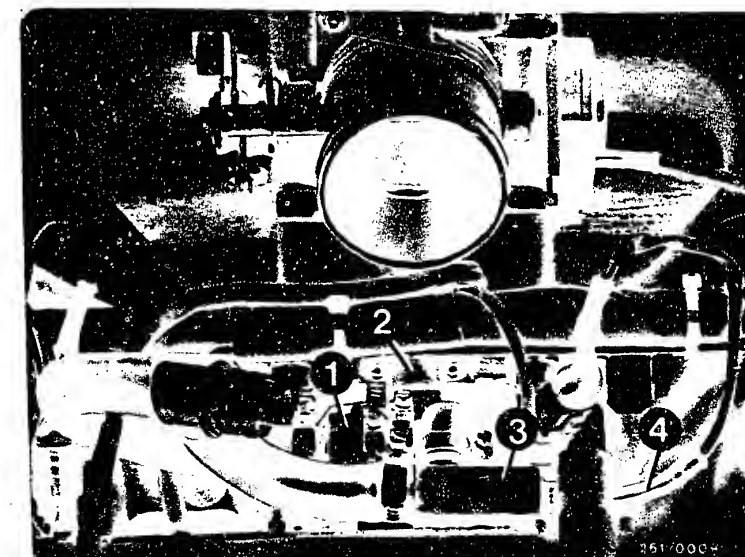
As of 8.80 date of manufacture

1 = Auxiliary-air device

2 = Start valve

3 = Idle-air adjusting screw

4 = Electric connection of  
auxiliary-air device



G21

Engine starts but then dies  
BMW 6 and 7 series



G22

Engine starts but then dies  
BMW 6 and 7 series





# Engine starts but then dies (continued)

Yes

As of 8.80 date of manufacture only:  
Auxiliary-air device tested?  
(Continued)

No

Testing (electrical - as of 8.80 date of manufacture)

Remove plug from auxiliary-air device.  
Connect ohmmeter to both terminals of auxiliary-air device:  
Test specification: 40...75  $\Omega$ .  
If the reading is outside tolerance, replace auxiliary-air device.

Yes

Testing completed for customer complaint

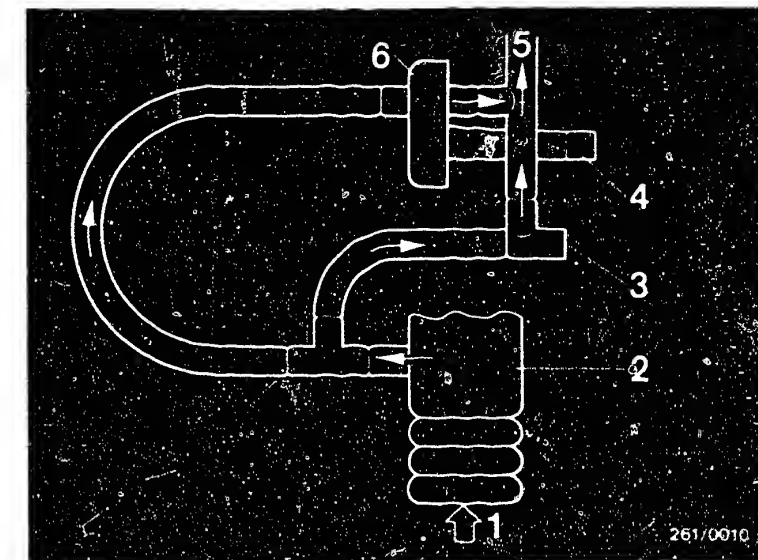
"Engine starts but then dies".

Customer complaint remedied?

No

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10).  
If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



- 1 = From air-flow sensor
  - 2 = Hose piece between air-flow sensor and throttle-valve assembly
  - 3 = Idle-air adjusting screw
  - 4 = Electric connection of auxiliary-air device
  - 5 = Bypass air to intake manifold (connection under start valve)
  - 6 = Auxiliary-air device
- Hose diagram for idle air and auxiliary-air device as of 8.1980 date of manufacture

G23

Engine starts but then dies  
BMW 6 and 7 series



G24

Engine starts but then dies  
BMW 6 and 7 series



## Trouble-shooting program according to customer complaints

### How to use the following trouble-shooting program

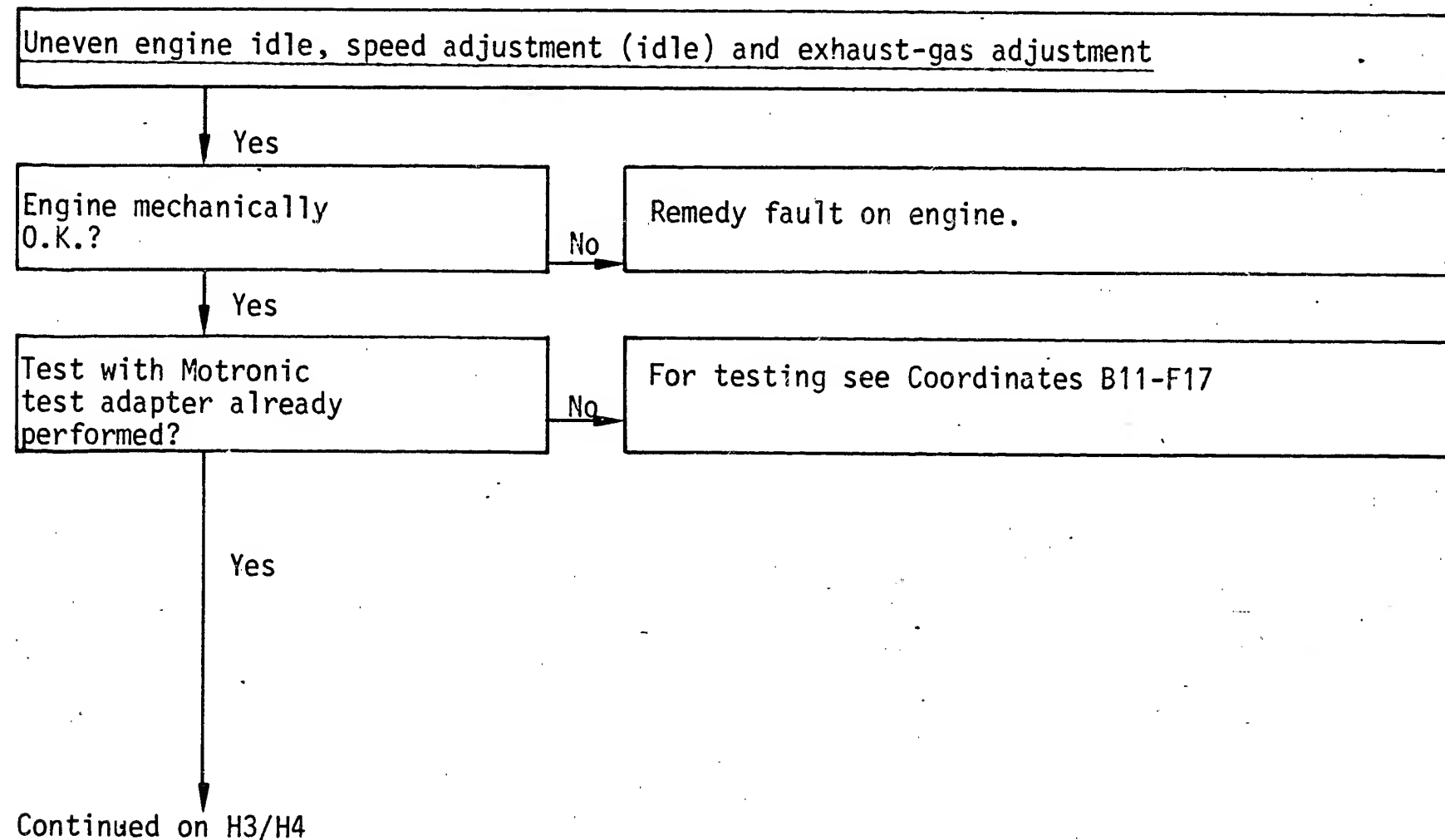
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If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



**H1**

Uneven engine idle  
BMW 6 and 7 series



**H2**

Uneven engine idle  
BMW 6 and 7 series



# Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

No

Check ignition coil and high-voltage section: Distributor cap oil-fouled inside and outside? (Remove distributor rotor and check camshaft seal).

Note: Distributor cap is fastened by 3 screws. When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx.  $0 \Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, H.T. ignition cables and spark plugs.

Yes

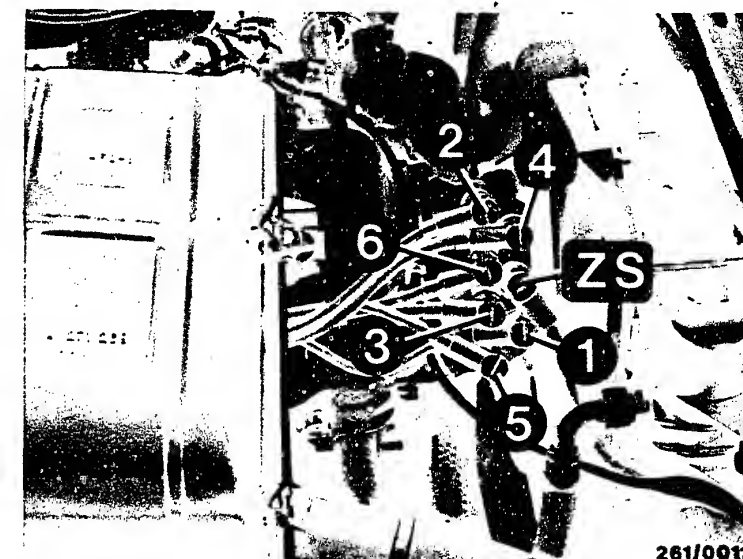
Air-flow sensor O.K.?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

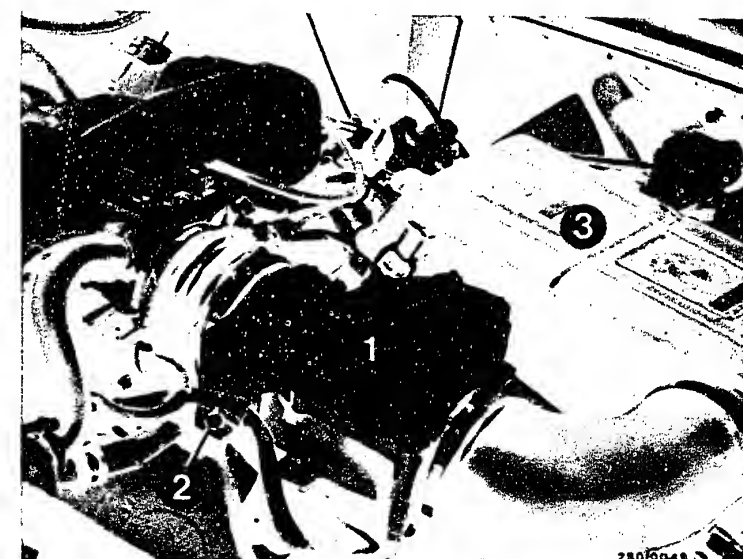
Yes

Continued on H5/H6



High-voltage distributor  
1 to 6 = Cylinder numbers  
ZS = High-tension cable to ignition coil

- 1 = Air-flow sensor
- 2 = Bypass screw (turning in a clockwise direction = lower CO concentration)
- 3 = Air filter



H3

Uneven engine idle  
BMW 6 and 7 series



H4

Uneven engine idle  
BMW 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Yes

Are all hose lines and electric leads securely attached?  
Visual examination.  
Is the air-intake system leak-tight?

No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.  
Checking for leaks: Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection.

Yes

Continued on H7/H8

**H5**

Uneven engine idle  
BMW 6 and 7 series



**H6**

Uneven engine idle  
BMW 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Yes

Auxiliary-air device tested?

No

Testing (mechanical):

1. Visual examination of auxiliary-air device:

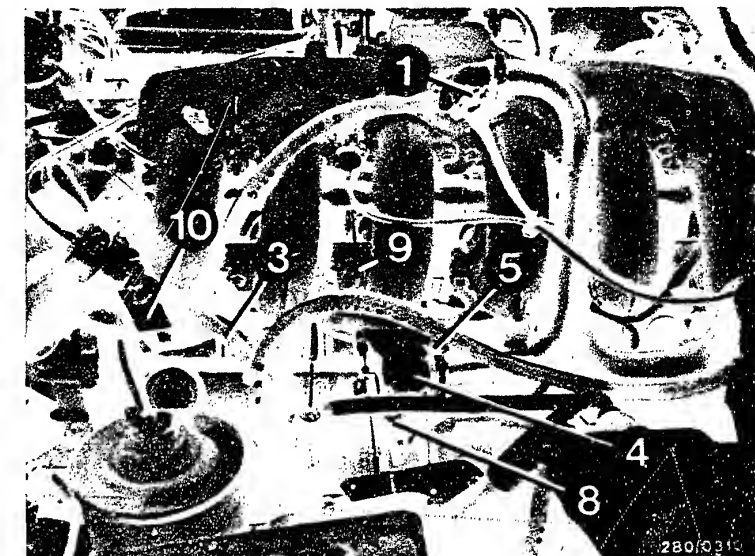
Remove hoses and look down, using a small mirror. In vehicles up to 8.80 date of manufacture blow air through. When cold, the device must be open when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:

With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

Yes

Continued on H9/H10



Up to 8.80 date of manufacture

1 = Start valve

4 = Auxiliary-air device

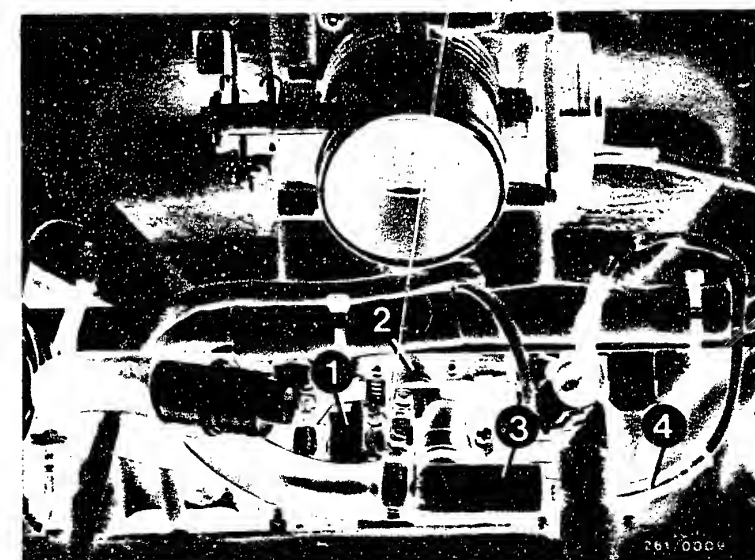
As of 8.80 date of manufacture

1 = Auxiliary-air device

2 = Start valve

3 = Idle-air adjusting screw

4 = Electric connection of auxiliary-air device



H7

Uneven engine idle  
BMW 6 and 7 series



H8

Uneven engine idle  
BMW 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Yes

As of 8.80 date of manufacture only:  
Auxiliary-air device tested?  
(Continued)

No

Testing (electrical - as of 8.80 date of manufacture)

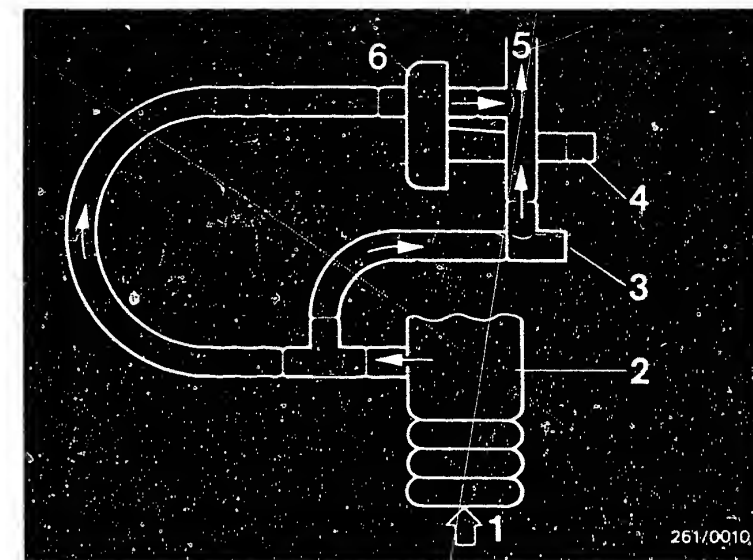
Remove plug from auxiliary-air device. Connect ohmmeter to both terminals of auxiliary-air device:

Test specification:  $40...75\ \Omega$ .

If the reading is outside tolerance, replace auxiliary-air device.

Yes

Continued on H11/H12



- 1 = From air-flow sensor
- 2 = Hose piece between air-flow sensor and throttle-valve assembly
- 3 = Idle-air adjusting screw
- 4 = Electric connection of auxiliary-air device
- 5 = Bypass air to intake manifold (connection under start valve)
- 6 = Auxiliary-air device

Hose diagram for idle air and auxiliary-air device as of 8.1980 date of manufacture

H9

Uneven engine idle  
BMW 6 and 7 series



H10

Uneven engine idle  
BMW 6 and 7 series





Uneven engine idle, speed adjustment (idle) and exhaust-gas test (continued)

Yes

Start valve O.K.?  
(Leaks)

No

Testing the start valve for leaks:

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

2. When removed:

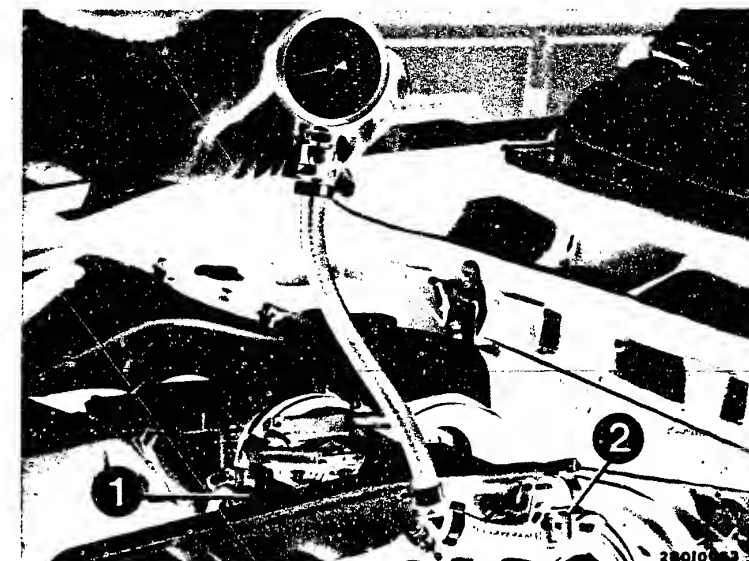
Remove the start valve (caution! fire hazard!).  
(Place collector vessel under the start valve).  
Build up the fuel pressure.

Test specification: Within one minute max.

1 drop may form at the mouth of the valve.

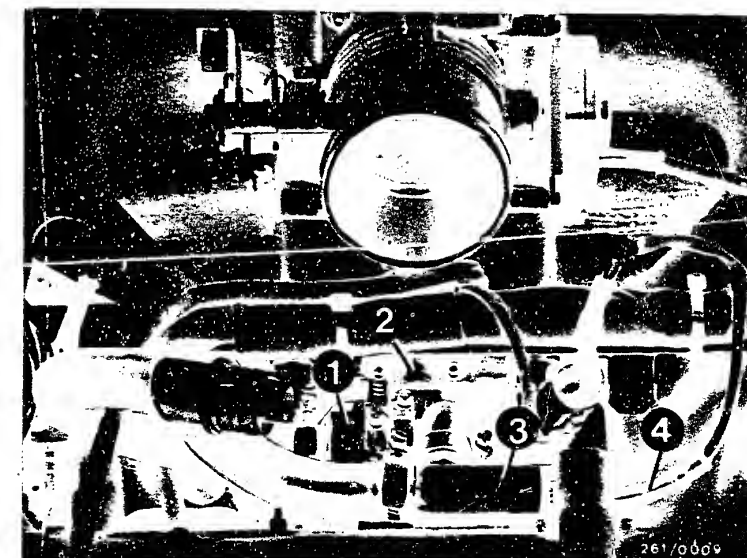
Yes

Continued on H13/H14



1 = Air hose to intake manifold  
2 = Start valve

1 = Auxiliary-air device  
2 = Start valve  
3 = Idle-air adjusting screw  
4 = Electric connection of auxiliary-air device



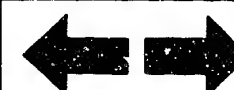
**H11**

Uneven engine idle  
BMW 6 and 7 series



**H12**

Uneven engine idle  
BMW 6 and 7 series



# Uneven engine idle, speed adjustment (idle) and exhaust-gas test (continued)

Yes

Injection valve mechanically O.K.?

No

With the engine running, disconnect the injection valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve is O.K. If not, replace injection valve.

Yes

With engine at normal operating temperature, set idle speed with idle screw to

$850 \dots 950 \text{ min}^{-1}$

With engine at normal operating temperature set CO adjusting screw to

$0.3 \dots 1.5 \% \text{ by vol. CO}$

No

If engine speed cannot be adjusted:  
Adjust throttle-valve stop.

If CO cannot be adjusted:

- CO concentration too low: Repeat leak test on air-intake system.
- CO concentration too high: Replace air-flow sensor.

Note: Use new plug in air-flow sensor after CO adjustment.

Yes

Testing completed for customer complaint

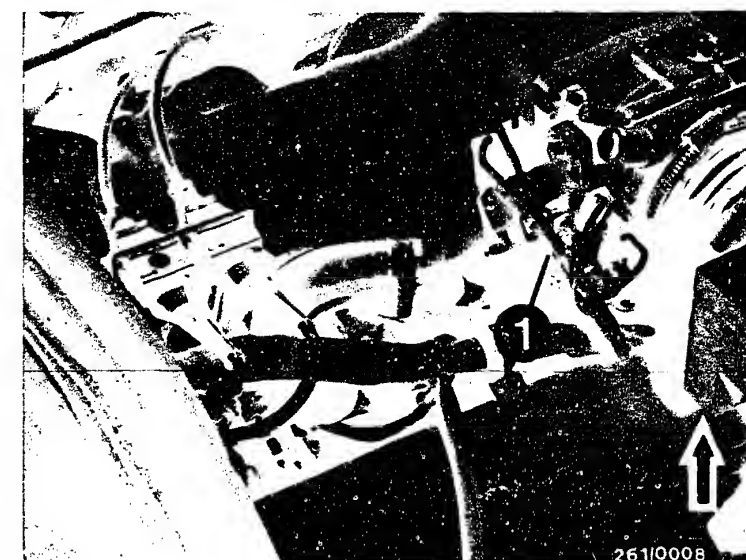
"Uneven engine idle".

Customer complaint remedied?

No

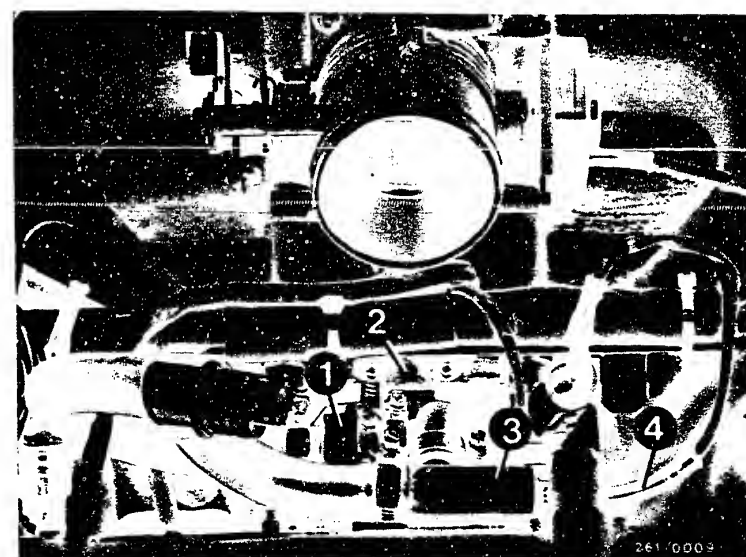
Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4)
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



Arrow = CO adjusting screw  
1 = Idle-speed adjusting screw

1 = Auxiliary-air device  
2 = Start valve  
3 = Idle-air adjusting screw  
4 = Electric connection of auxiliary-air device



H13

Uneven engine idle  
BMW 6 and 7 series



H14

Uneven engine idle  
BMW 6 and 7 series



## Trouble-shooting program according to customer complaints

### How to use the following trouble-shooting program

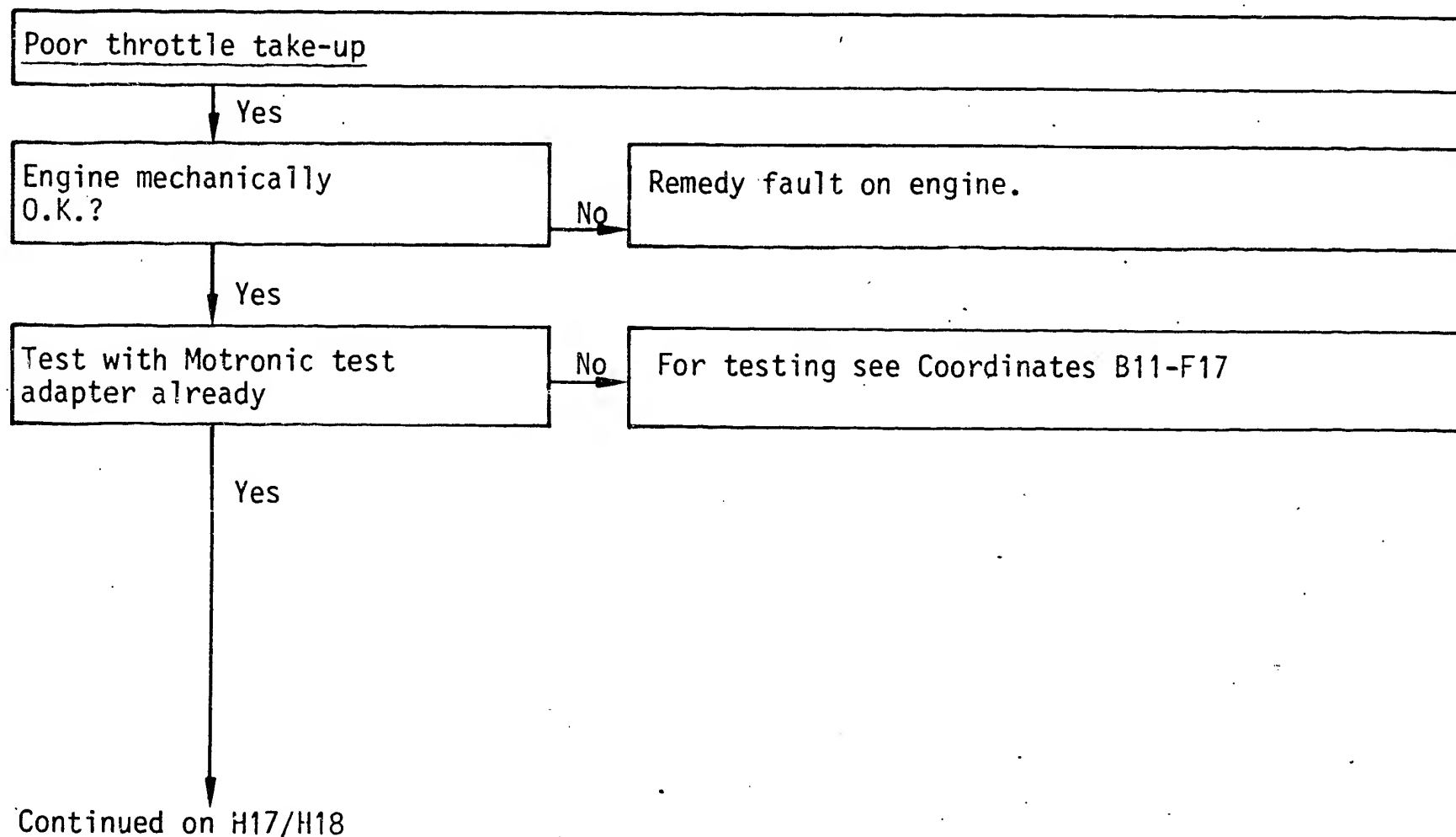
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3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



**H15**

Poor throttle take-up  
BMW 6 and 7 series



**H16**

Poor throttle take-up  
BMW 6 and 7 series



# Poor throttle take-up (continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

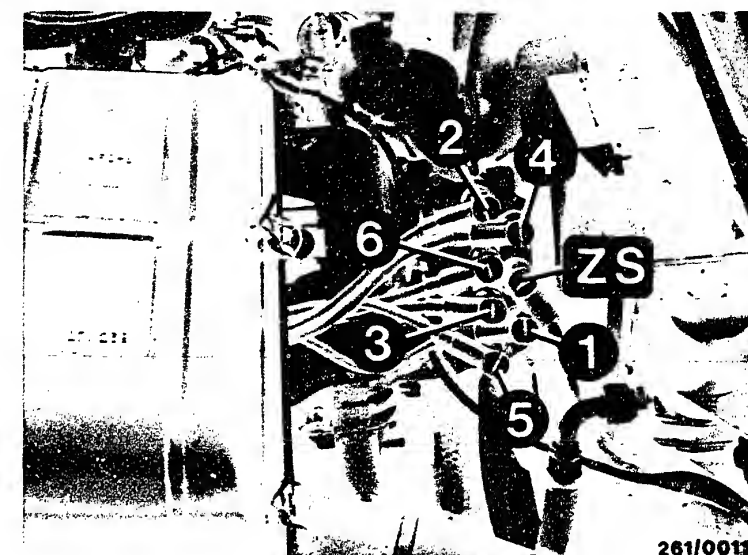
No

Check ignition coil and high-voltage section: Distributor cap oil-fouled inside and outside? (Remove distributor rotor and check camshaft seal).

Note: Distributor cap is fastened by 3 screws. When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx.  $0\ \Omega$ ). Secondary resistance: 5 to  $7.2\ k\Omega$ . Check interference-suppression resistors. H.T. ignition cables and spark plugs.

Yes

Continued on H19/H20



High-voltage distributor  
1 to 6 = Cylinder numbers  
ZS = High-tension cable to  
ignition coil

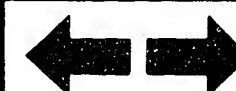
**H17**

Poor throttle take-up  
BMW 6 and 7 series



**H18**

Poor throttle take-up  
BMW 6 and 7 series



Poor throttle take-up (continued)

Yes

Air-flow sensor mechanically O.K.?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Yes

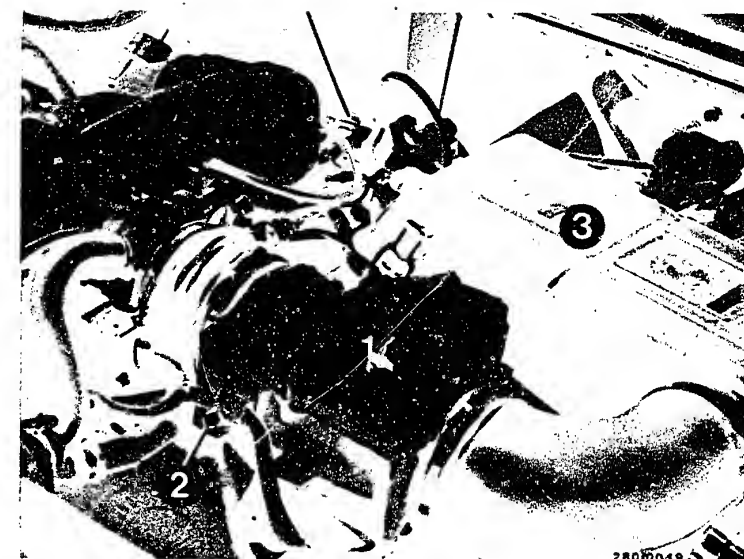
Are all hose lines and electric leads securely attached? Visual examination. Is the air-intake system leak-tight?

No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws. Checking for leaks: Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection.

Yes

Continued on H21/H22



1 = Air-flow sensor

2 = Bypass screw

(Turning in a clockwise direction = lower CO concentration)

3 = Air filter

**H19**

Poor throttle take-up  
BMW 6 and 7 series



**H20**

Poor throttle take-up  
BMW 6 and 7 series



## Poor throttle take-up (continued)

Yes

Auxiliary-air device  
tested?

No

### Testing (mechanical):

#### 1. Visual examination of auxiliary-air device:

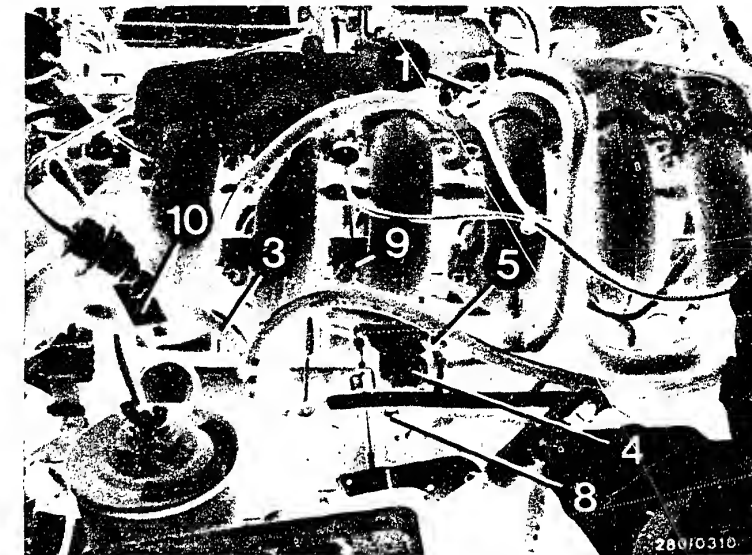
Remove hoses and look down, using a small mirror. In vehicles up to 8.80 date of manufacture blow air through.

When cold, the device must be open; when the engine is warm it must be closed. If not, replace auxiliary-air device.

#### 2. Functional test of auxiliary-air device:

With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

Yes



Up to 8.80 date of manufacture

1 = Start valve

4 = Auxiliary-air device

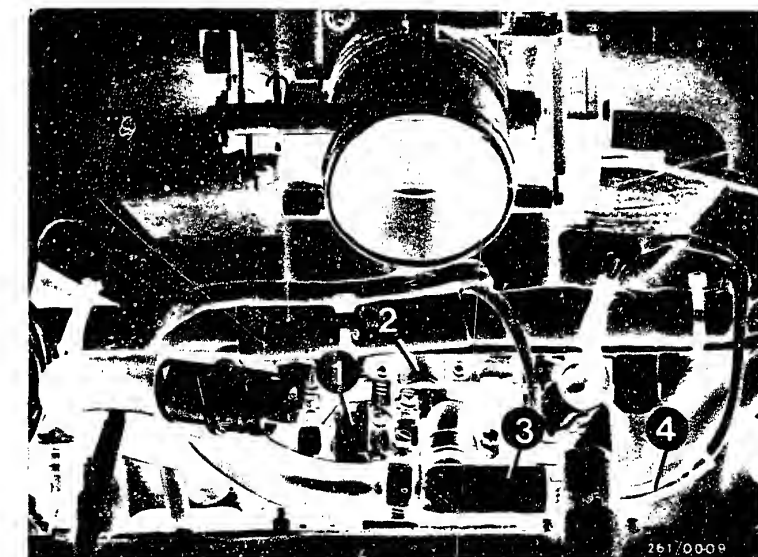
As of 8.80 date of manufacture

1 = Auxiliary-air device

2 = Start valve

3 = Idle-air adjusting screw

4 = Electric connection of  
auxiliary-air device



Continued on H23/H24

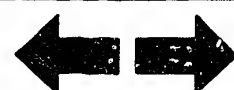
**H21**

Poor throttle take-up  
BMW 6 and 7 series



**H22**

Poor throttle take-up  
BMW 6 and 7 series





## Poor throttle take-up (continued)

Yes

As of 8.80 date of manufacture only:  
Auxiliary-air device tested?  
(Continued)

No

Testing (electrical - as of 8.80 date of manufacture)

Remove plug from auxiliary-air device. Connect ohmmeter to both terminals of auxiliary-air device:

Test specification: 40...75  $\Omega$ .

If the reading is outside tolerance, replace auxiliary-air device.

Yes

Testing completed for customer complaint

"Poor throttle take-up"

Customer complaint remedied?

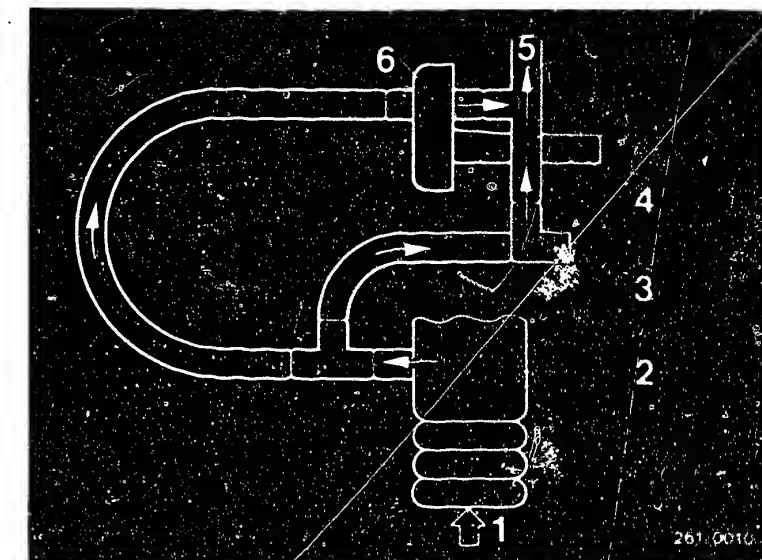
No

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10).

If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).

- Engine not mechanically O.K. (Compression, - valve setting, valve timing, worn camshaft).



- 1 = From air-flow sensor
- 2 = Hose piece between air-flow sensor and throttle-valve assembly
- 3 = Idle-air adjusting screw
- 4 = Electric connection of auxiliary-air device
- 5 = Bypass air to intake manifold (connection under start valve)
- 6 = Auxiliary-air device

Hose diagram for idle air and auxiliary-air device as of 8.1980 date of manufacture

**H23**

Poor throttle take-up  
BMW 6 and 7 series



**H24**

Poor throttle take-up  
BMW 6 and 7 series



## Trouble-shooting program according to customer complaints

### How to use the following trouble-shooting program

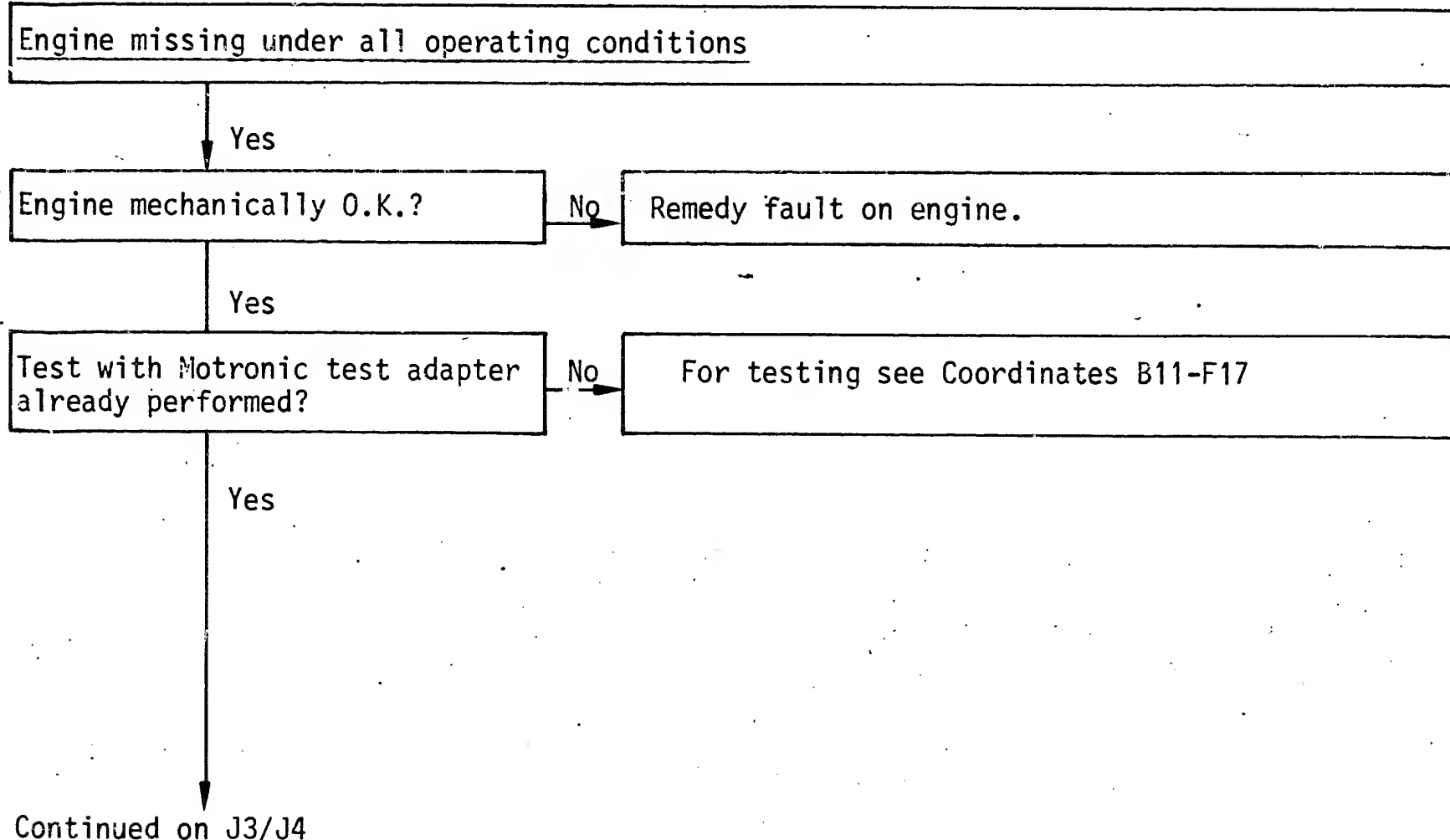
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



**J1.**

Engine missing  
BMW 6 and 7 series

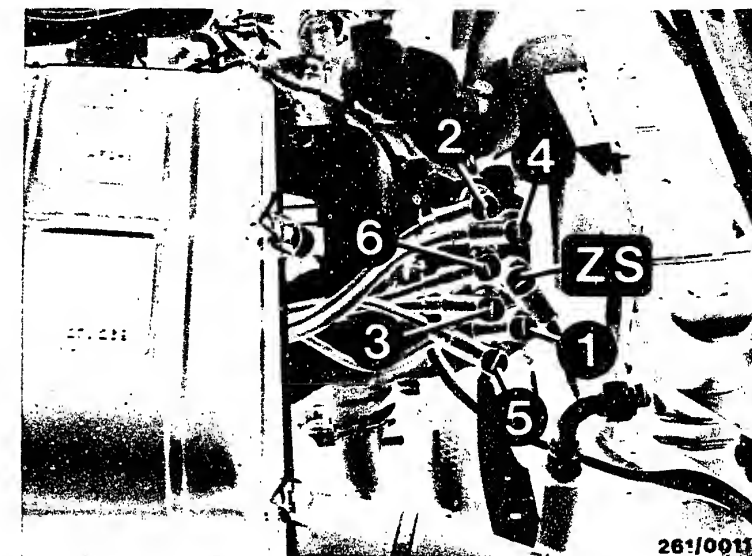
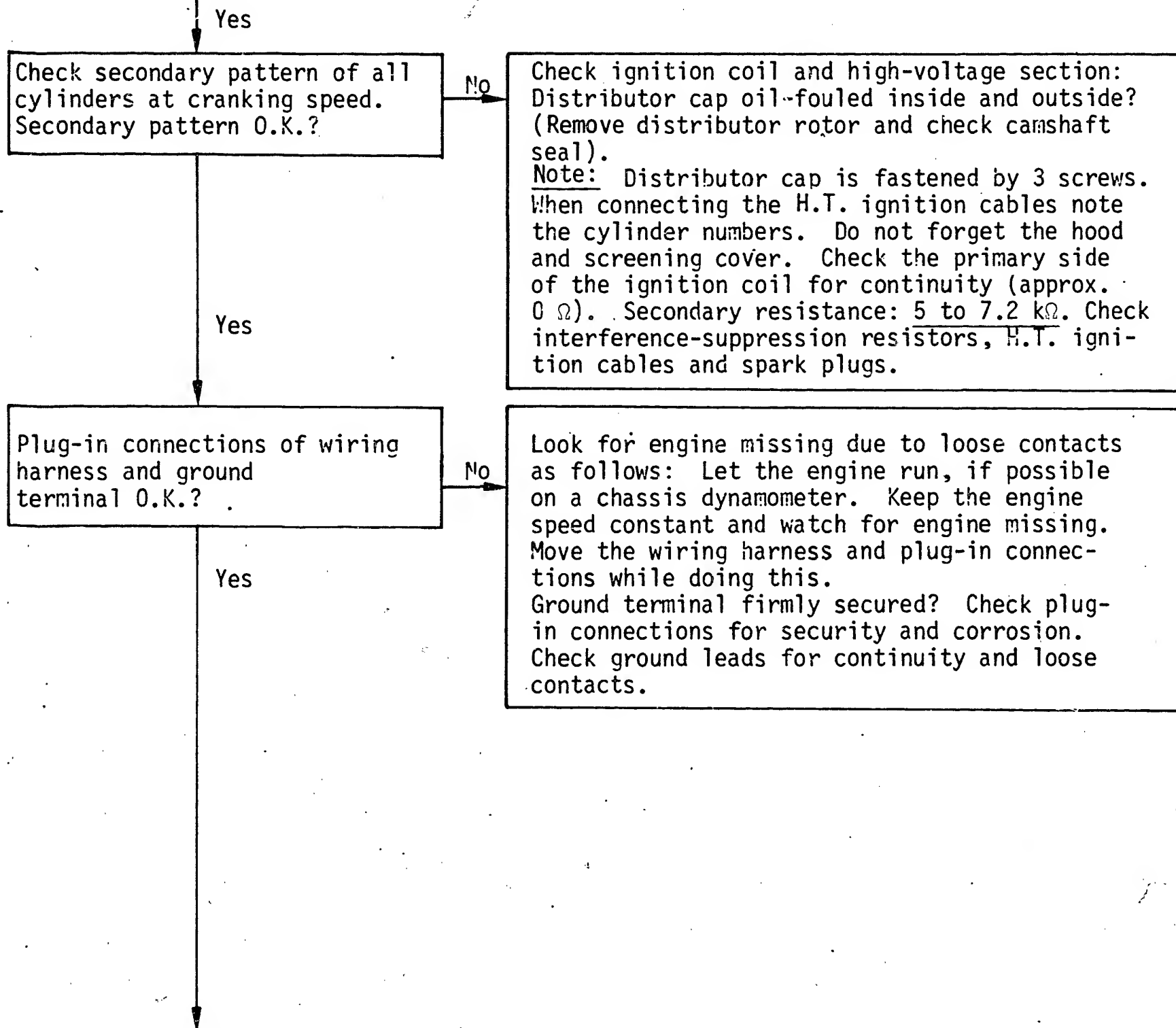


**J2**

Engine missing  
BMW 6 and 7 series



Engine missing under all operating conditions (continued)



High-voltage distributor  
1 to 6 = Cylinder numbers  
ZS = High-tension cable to ignition coil

J3

Engine missing  
BMW 6 and 7 series



J4

Engine missing  
BMW 6 and 7 series



Engine missing under all operating conditions (continued)

Yes

Start valve O.K.?

No

Testing the start valve for leaks:

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

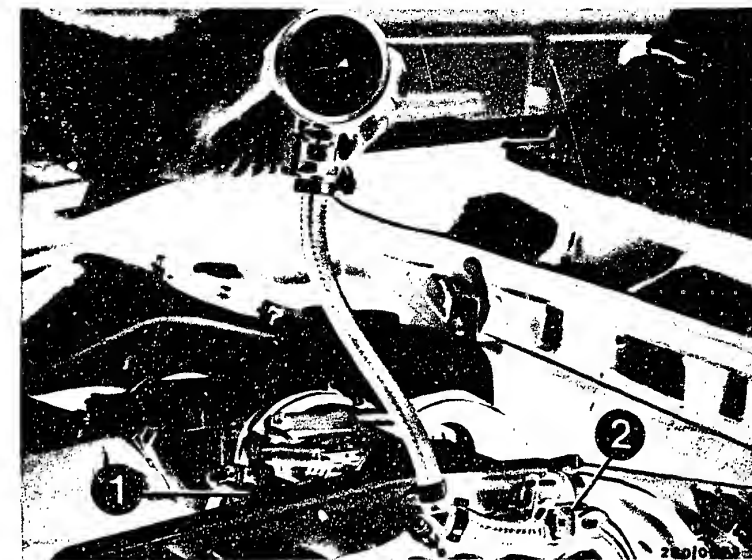
2. When removed:

Remove the start valve (caution! fire hazard!). (Place collector vessel under the start valve). Build up the fuel pressure.

Test specification: Within one minute max.  
1 drop may form at the mouth of the valve.

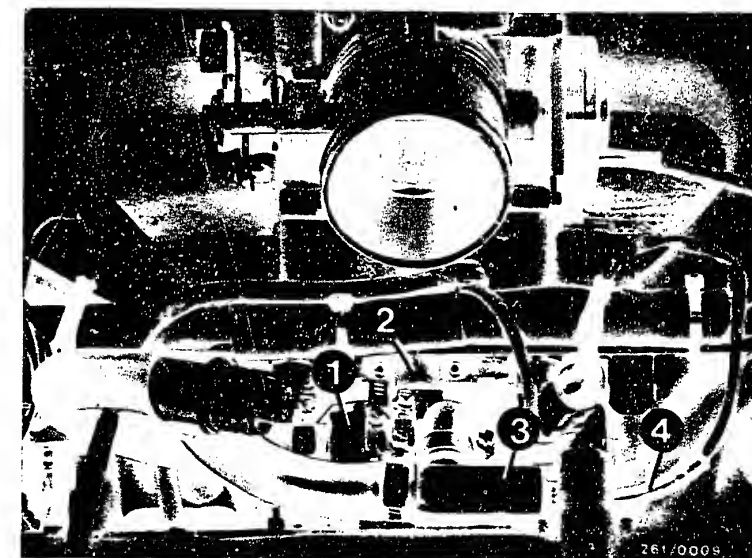
Yes

Continued on J7/J8



1 = Air hose to intake manifold  
2 = Start valve

1 = Auxiliary-air device  
2 = Start valve  
3 = Idle-air adjusting screw  
4 = Electric connection of auxiliary-air device



J5

Engine missing  
BMW 6 and 7 series



J6

Engine missing  
BMW 6 and 7 series



# Engine missing under all operating conditions (continued)

Yes

Fuel delivery O.K.?

No

## Measuring the fuel delivery:

For testing, undo the junction between the fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale. Switch on fuel pump.

Test specification - 3.0 E engine:  
min. 850 cm<sup>3</sup>/30 sec

## Remedy if test specification not reached:

- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12 V → clean contacts; possibly also eliminate poor ground connection, replace leads.
- Fuel pressure regulator defective → replace
- Fuel pump delivery too low → replace fuel pump.

Yes

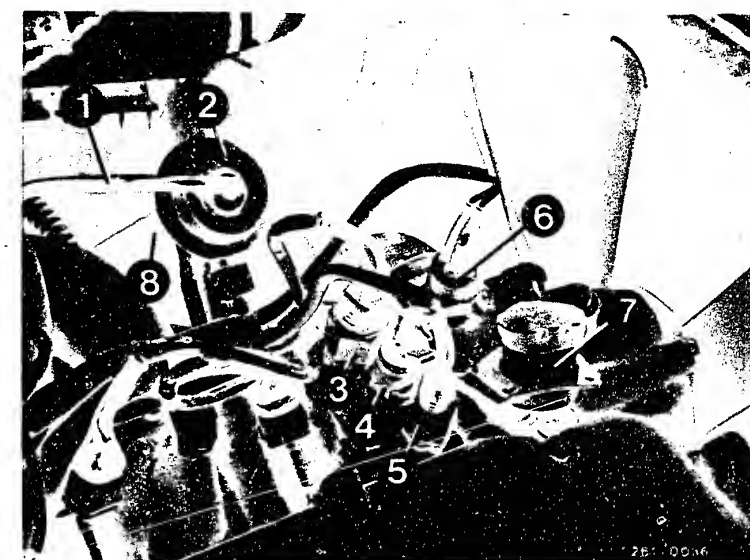
Control unit O.K.?

No

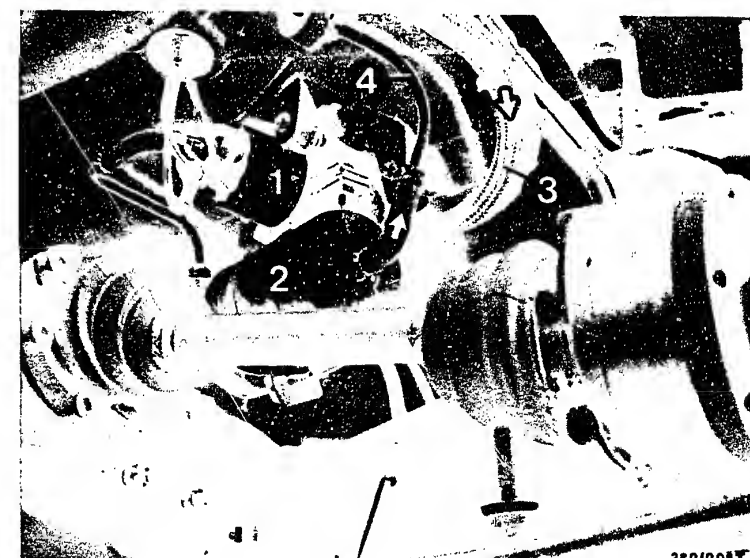
Let engine run. Shake control unit lightly and move multiple plug. Watch for engine missing. Restore plug-in connection on multiple plug or replace defective control unit.

Yes

Continued on J9/J10



- 1 = Air hose to intake manifold  
2 = Pressure regulator, screwed onto fuel-distribution pipe  
8 = Return hose  
1 = Fuel pump  
2 = Fuel filter  
3 = Fuel intake line  
4 = Fuel delivery line  
Arrow = Direction of fuel flow



J7

Engine missing

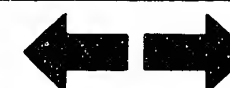
BMW 6 and 7 series



J8

Engine missing

BMW 6 and 7 series



Engine missing under all operating conditions (continued)

Yes

Air-flow sensor O.K.?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

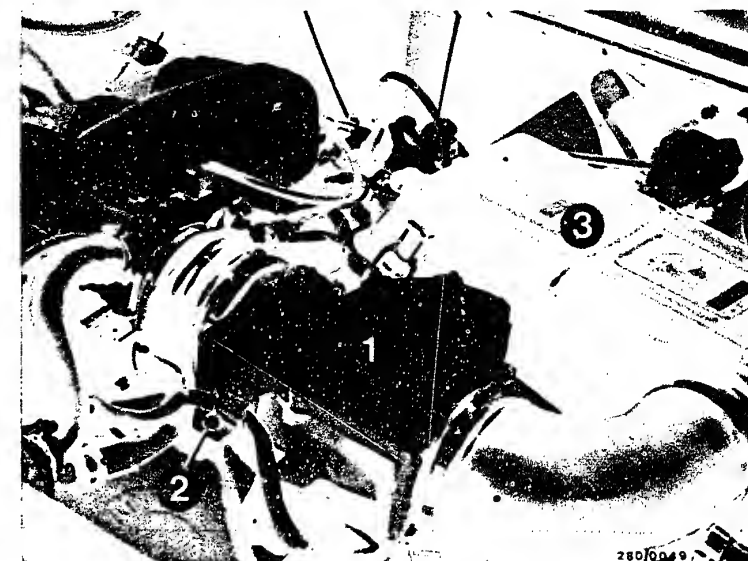
Noise test:

Remove air-flow sensor. Remove air filter by opening snap fasteners.

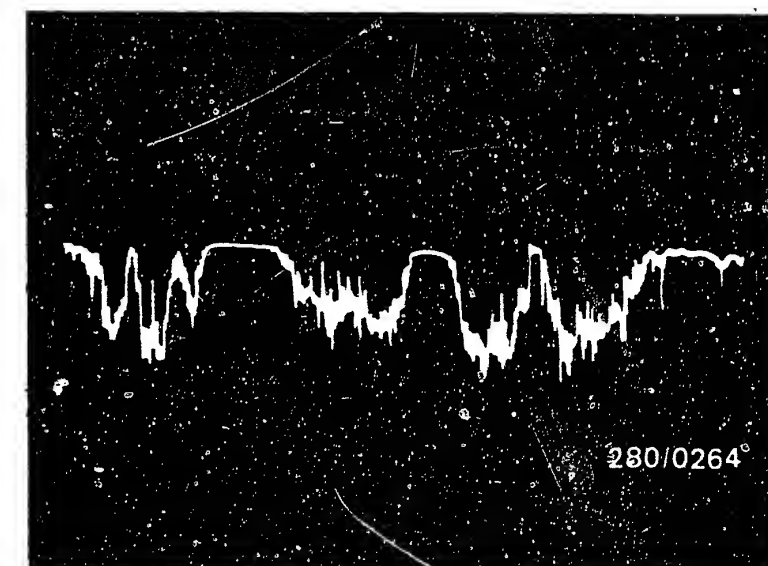
Leave plug on. Set motortester to special input and connect using special cable to air-flow sensor term. 7 (red clip) and term. 6 (black clip). Set control stick for image adjustment on motortester as far as it will go to the left (calibrated setting). Deflect air-flow sensor flap suddenly (several times). If incorrect (see illustration) replace air-flow sensor.

Yes

Continued on J11/J12



- 1 = Air-flow sensor
- 2 = Bypass screw
- 3 = Air filter



J9

Engine missing  
BMW 6 and 7 series



J10

Engine missing  
BMW 6 and 7 series





Engine missing under all operating conditions (continued)

Yes

Generator with regulator O.K.?  
(Engine missing due to  
voltage peaks).

No

With the engine switched off, remove the plug from the generator.  
Start the engine. If missing stops, test generator and regulator.

Yes

Are all necessary interfer-  
ence-suppression devices  
installed? Check inter-  
ference-suppression  
resistors. Measure resis-  
tance. O.K.?

No

Ensure that interference suppression is correct.  
Interference-suppression resistors must not be less than 5 kΩ.

Yes

Check spark-plug connectors  
for arcing damage. O.K.?

No

Replace spark-plug connectors.

Yes

Testing completed for  
customer complaint  
"Engine missing under all  
operating conditions".  
Customer complaint remedied?

No

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10).  
If the fault has not been detected by "direct trouble-shooting", see  
"detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing,  
worn camshaft).

J11

Engine missing  
BMW 6 and 7 series



J12

Engine missing  
BMW 6 and 7 series



## Trouble-shooting program according to customer complaints

### How to use the following trouble-shooting program

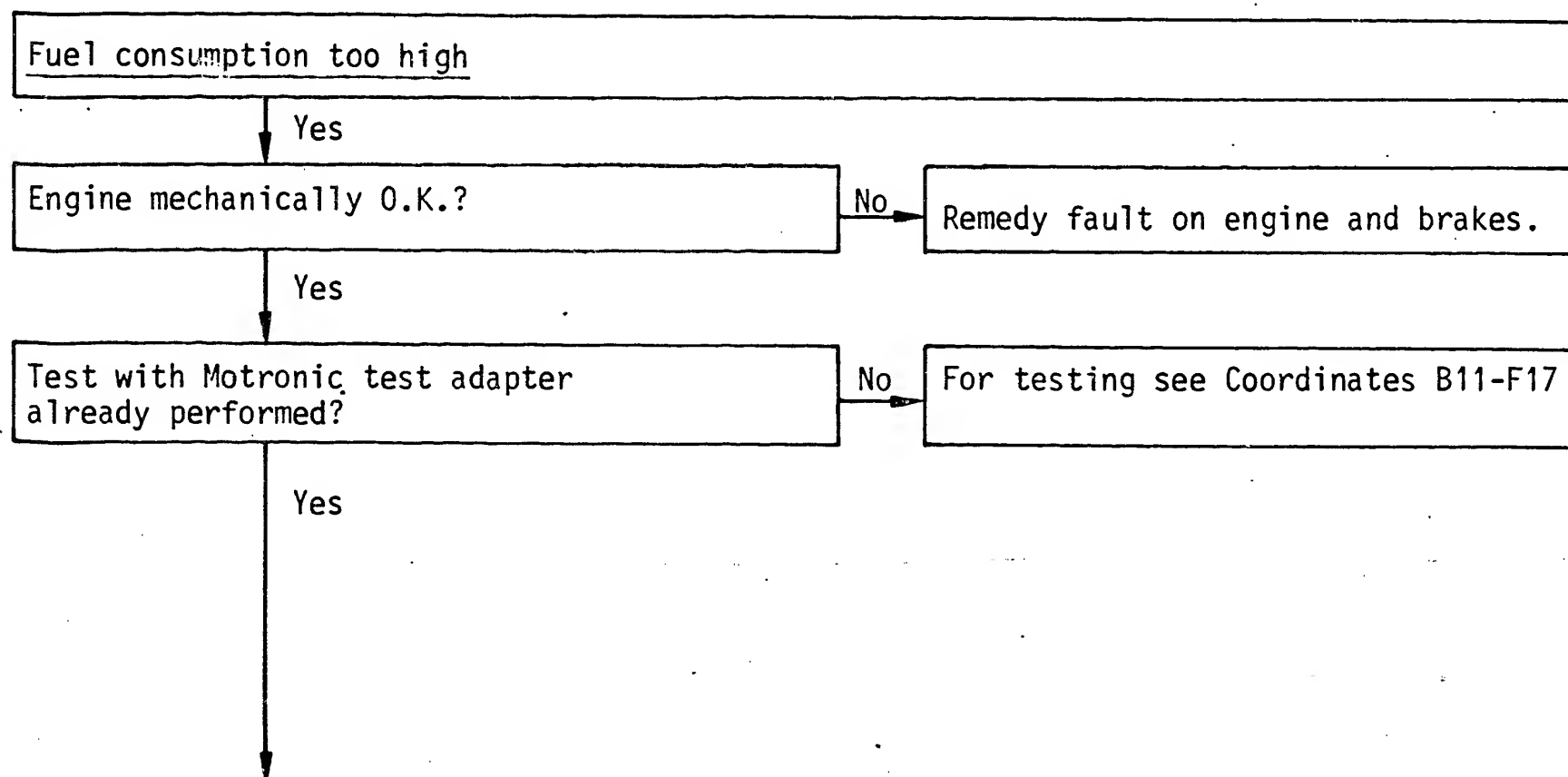
The program is divided into 3 rows of boxes:

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If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on J15/J16

**J13**

Fuel consumption too high  
BMW 6 and 7 series



**J14**

Fuel consumption too high  
BMW 6 and 7 series



# Fuel consumption too high (continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

No

Check ignition coil and high-voltage section: Distributor cap oil-fouled inside and outside? (Remove distributor rotor and check camshaft seal).  
Note: Distributor cap is fastened by 3 screws. When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx.  $0\ \Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, H.T. ignition cables and spark plugs.

Yes

Start valve O.K.? (Leaks)

No

Testing the start valve for leaks:

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

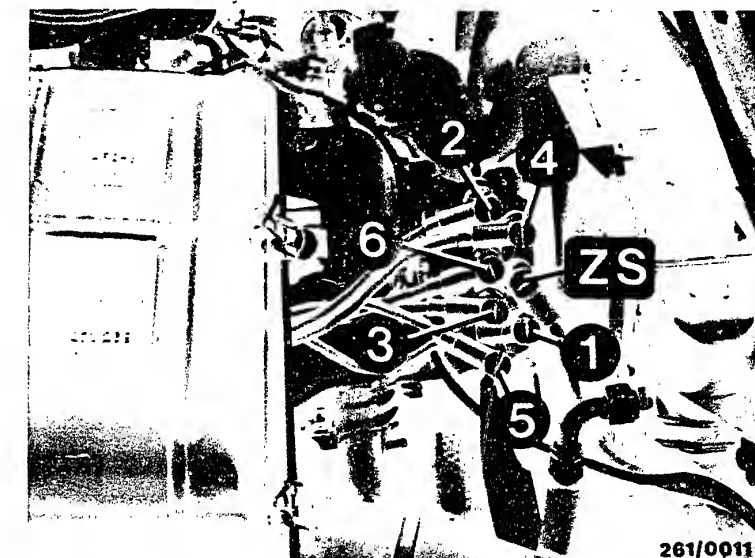
2. When removed:

Remove the start valve (caution! fire hazard!). Fuel line and electric lead remain connected. (Place collector vessel under the start valve). Build up the fuel pressure.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

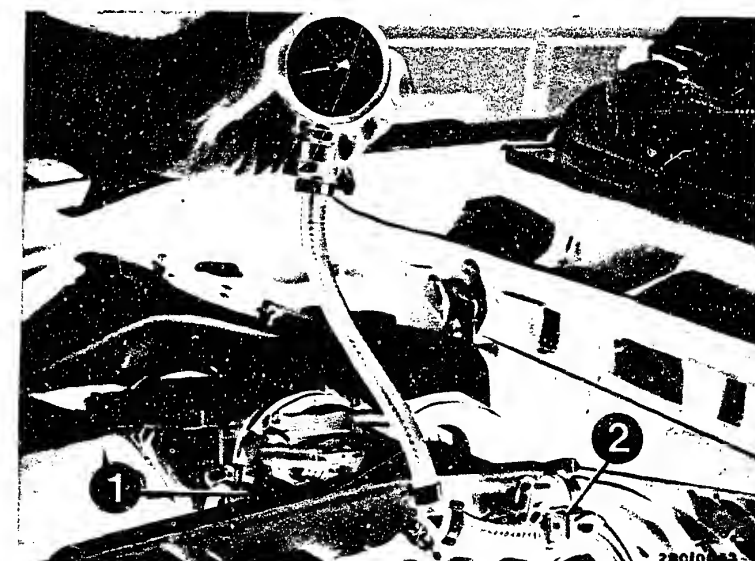
Yes

Continued on J17/J18



High-voltage distributor  
1 to 6 = Cylinder numbers  
ZS = High-tension cable to ignition coil

Model up to 8.80 date of manufacture  
1 = Vacuum hose  
2 = Start valve



**J15**

Fuel consumption too high  
BMW 6 and 7 series



**J16**

Fuel consumption too high  
BMW 6 and 7 series



# Fuel consumption too high (continued)

Yes

Air-flow sensor O.K.?

No

**Testing:** Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Yes

Testing completed for customer complaint

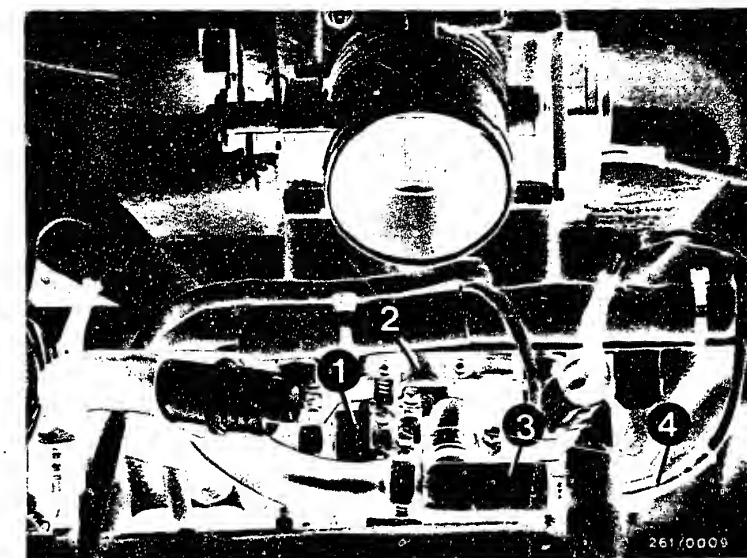
"Fuel consumption too high".

Customer complaint remedied?

No

**Further possibilities:**

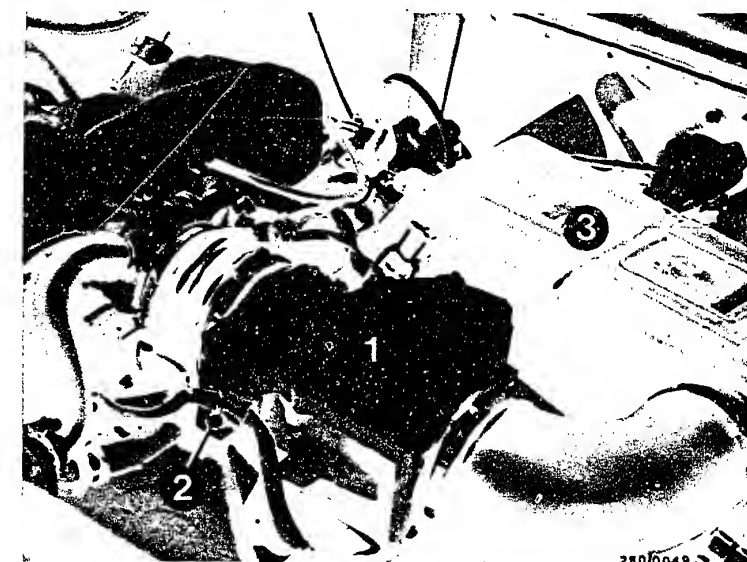
- Customer complaint incorrectly diagnosed (see Coordinates B3...B10). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



Model as of 8.80 date of manufacture

- 1 = Auxiliary-air device
- 2 = Start valve
- 3 = Idle-air adjusting screw
- 4 = Electric connection of auxiliary-air device

- 1 = Air-flow sensor
- 2 = Bypass screw
- 3 = Air filter



**J17**

Fuel consumption too high

BMW 6 and 7 series



**J18**

Fuel consumption too high

BMW 6 and 7 series



## Trouble-shooting program according to customer complaints

### How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:

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3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.

No maximum engine power / top speed not reached

Yes

Engine mechanically O.K.?

No

Remedy fault on engine.

Yes

Test with Motronic test  
adapter already performed?

No

For testing see Coordinates B11-F17

Yes

Continued on K3/K4

**K1**

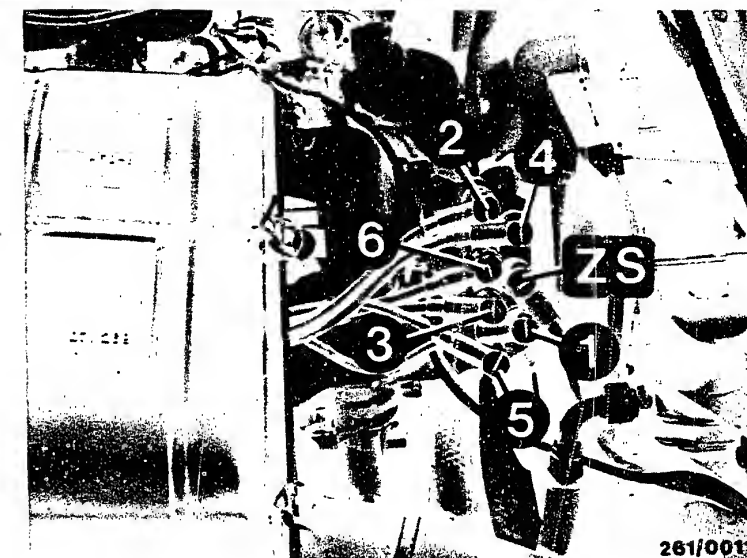
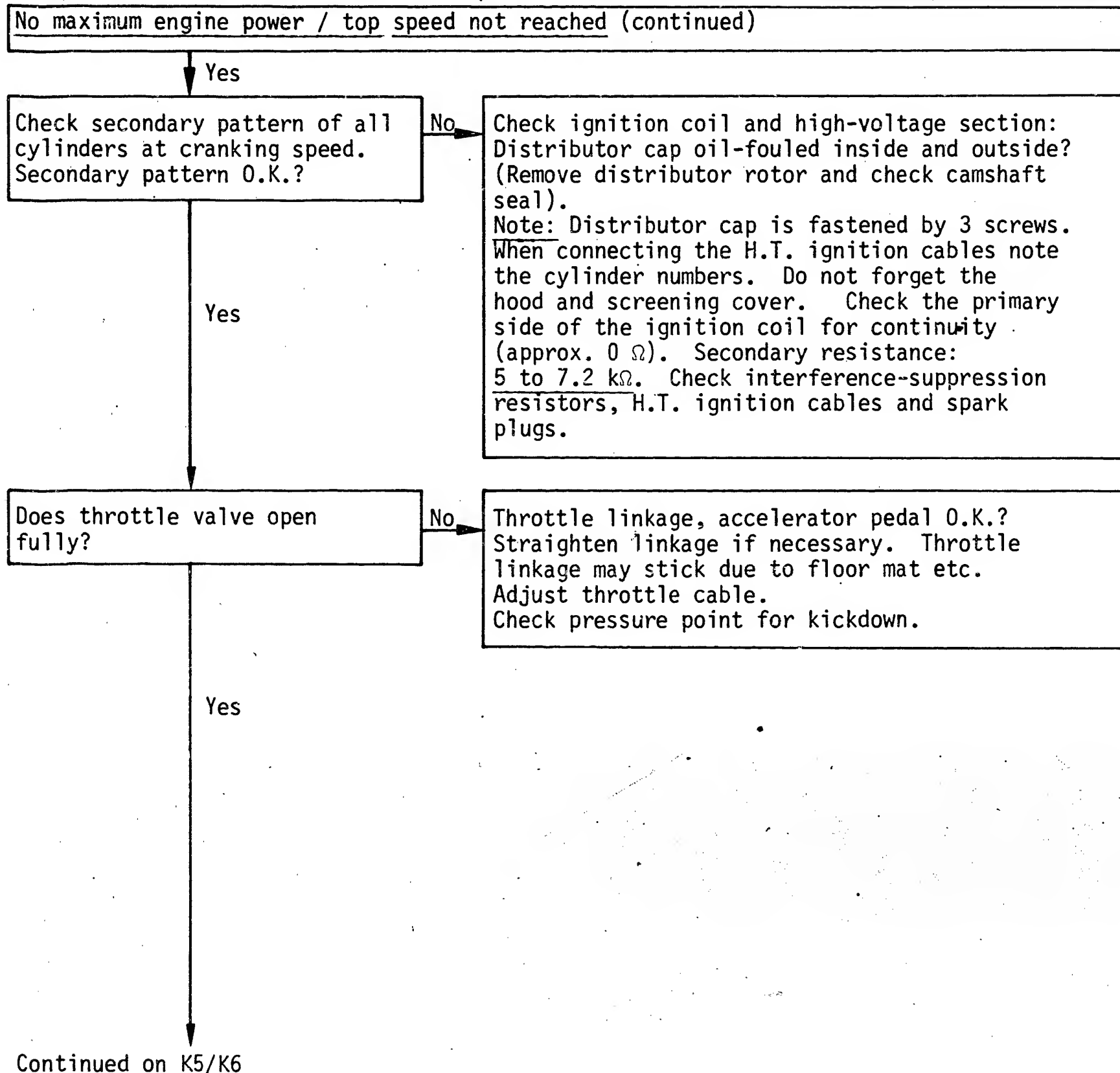
No maximum engine power  
BMW 6 and 7 series



**K2**

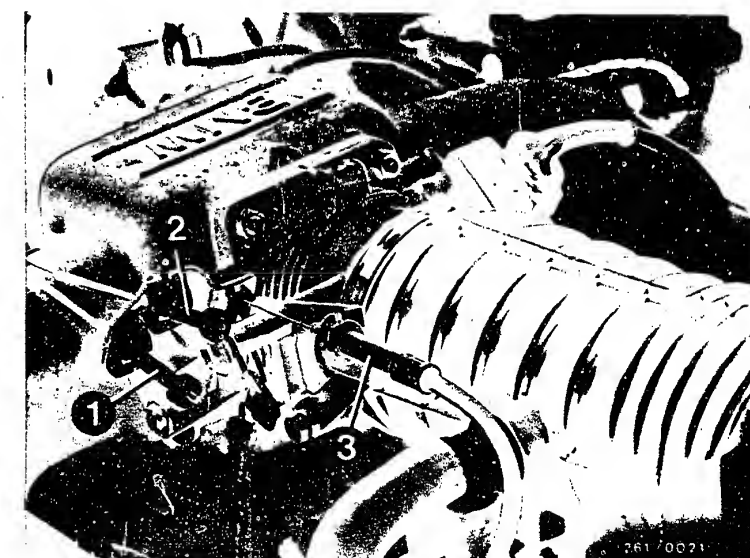
No maximum engine power  
BMW 6 and 7 series





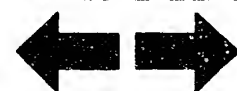
High-voltage distributor  
1 to 6 = Cylinder numbers  
ZS = High-tension cable to ignition coil

- 1 = Cable to transmission control
- 2 = Cable to cruise control
- 3 = Cable to accelerator



**K3**

No maximum engine power  
BMW 6 and 7 series



**K4**

No maximum engine power  
BMW 6 and 7 series





No maximum engine power / top speed not reached (continued)

Yes

Fuel pressure at full load O.K.?

No

Test the fuel pressure on a chassis dynamometer at rated speed and rated power: Connect pressure gauge to start valve or fuel-distribution pipe.

Caution: When removing the fuel hose make sure that no fuel gets onto hot parts of the engine.

Test specification at full load:

2.3...2.7 bar  
(Reading may fluctuate slightly).

Remedy if test specification not reached:

- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12 V → clean contacts, possibly eliminate poor ground connection, replace leads.
- Fuel pressure regulator defective → replace
- Fuel pump delivery too low → replace fuel pump.
- Strainer in tank clogged? Corrosion in tank?

Yes

Continued on K7/K8

**K5**

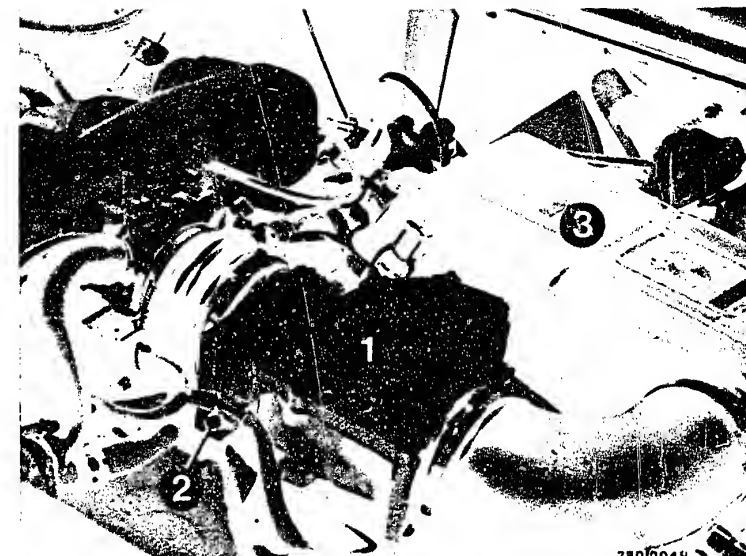
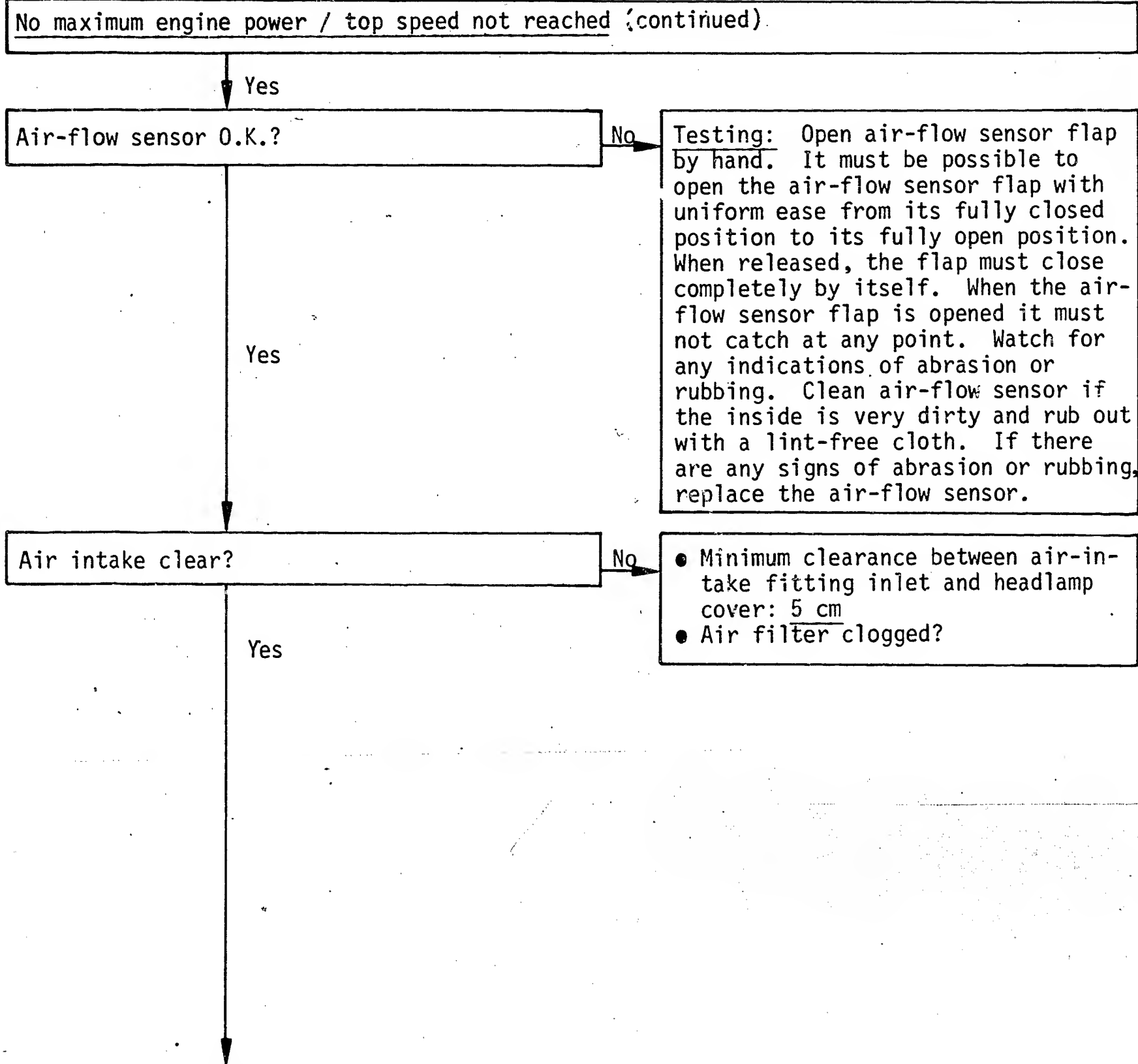
No maximum engine power  
BMW 6 and 7 series



**K6**

No maximum engine power  
BMW 6 and 7 series





1 = Air-flow sensor  
2 = Bypass screw  
3 = Air filter

**K7**

No maximum engine power  
BMW 6 and 7 series



**K8**

No maximum engine power  
BMW 6 and 7 series



No maximum engine power / top speed not reached (continued)

Yes

Fuel delivery O.K.?

No

Measuring the fuel delivery:

For testing, undo the junction between the fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale. Switch on fuel pump.

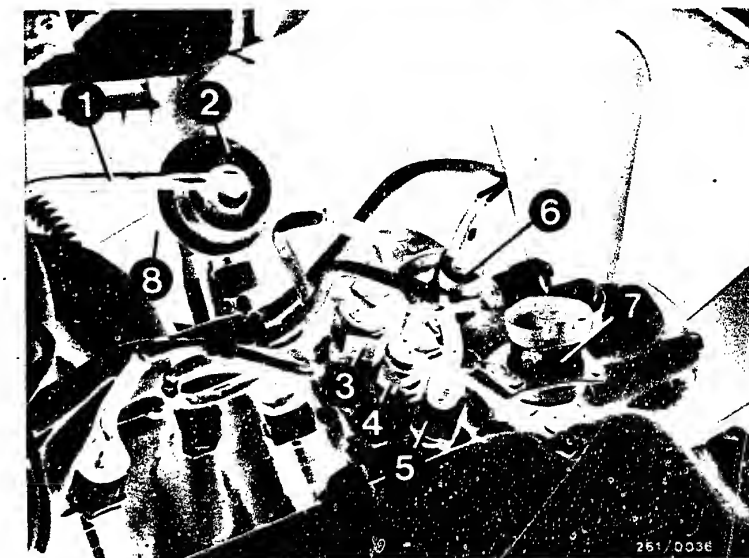
Test specification: min. 850 cm<sup>3</sup>/30s

Remedy if test specification not reached:

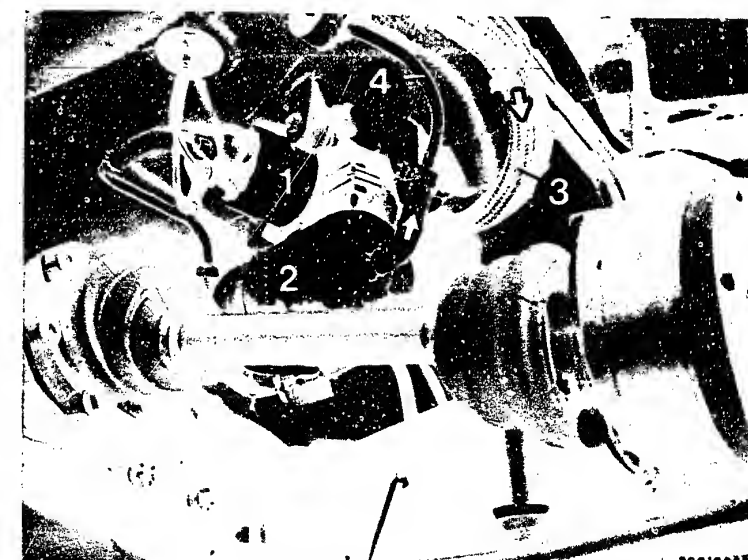
- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12 V → clean contacts; possibly also eliminate poor ground connection, replace leads.
- Fuel pressure regulator defective → replace
- Fuel pump delivery too low → replace fuel pump
- Strainer in tank clogged? Corrosion in tank?

Yes

Continued on K11/K12



- 1 = Air hose to intake manifold  
2 = Pressure regulator, screwed onto fuel-distribution pipe  
8 = Return hose  
1 = Fuel pump  
2 = Fuel filter  
3 = Fuel intake line  
4 = Fuel delivery line  
Arrow = Direction of fuel flow



K9

No maximum engine power  
BMW 6 and 7 series



K10

No maximum engine power  
BMW 6 and 7 series



No maximum engine power / top speed not reached (continued)

Yes

Are all hose lines and electric leads securely attached?  
Visual examination.  
Is the air-intake system leak-tight?

No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.  
Checking for leaks: Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection.

Yes

Testing completed for customer complaint

"No maximum engine power".

Customer complaint remedied?

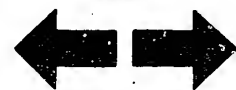
No

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3... B10). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).

**K11**

No maximum engine power  
BMW 6 and 7 series



**K12**

No maximum engine power  
BMW 6 and 7 series



## Trouble-shooting program according to customer complaints

### How to use the following trouble-shooting program

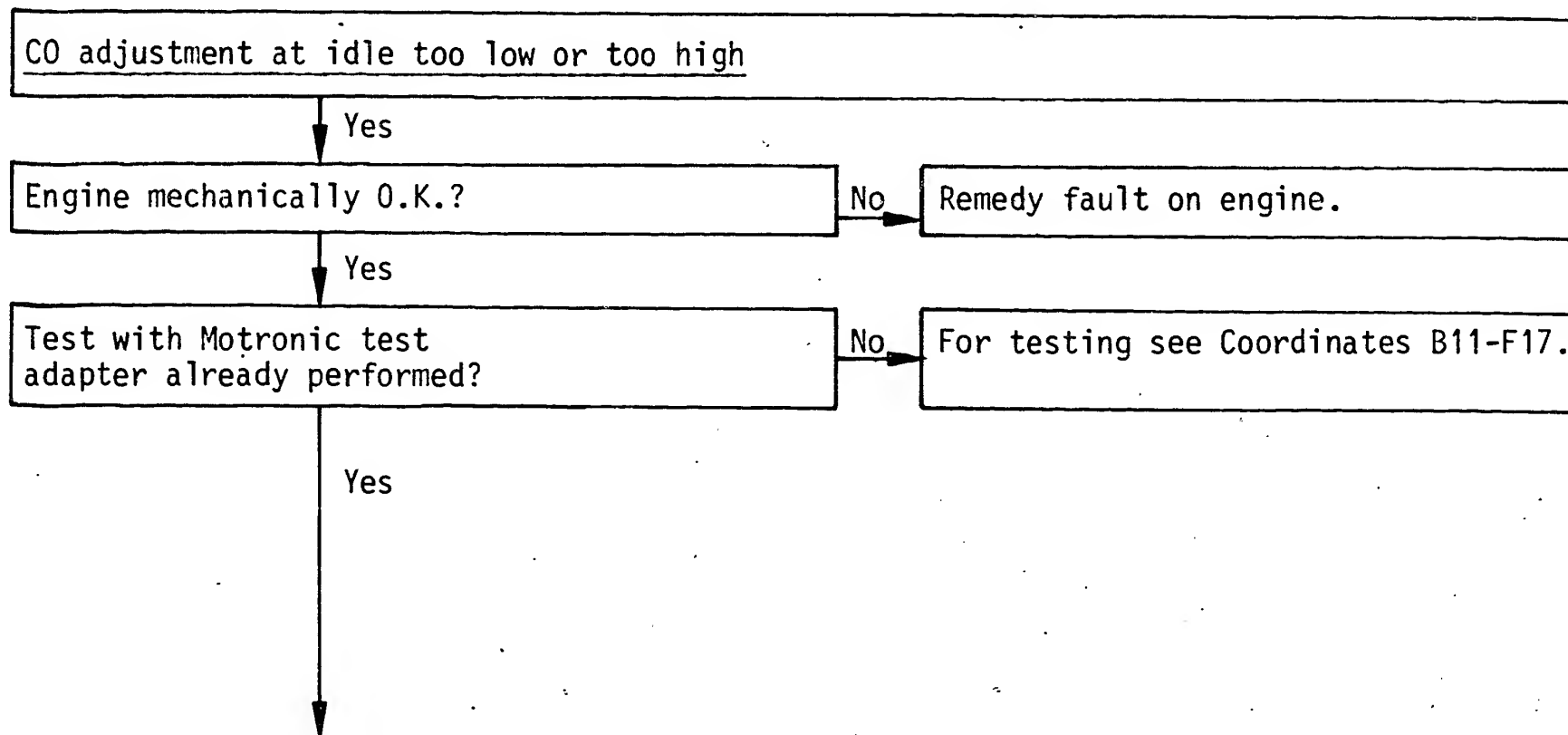
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1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on K15/K16

**K13**

CO adjustment  
BMW 6 and 7 series



**K14**

CO adjustment  
BMW 6 and 7 series



# CO adjustment at idle too low or too high (continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

No

Check ignition coil and high-voltage section: Distributor cap oil-fouled inside and outside? (Remove distributor rotor and check camshaft seal).

Note: Distributor cap is fastened by 3 screws. When connecting the H.T. ignition cables note the cylinder numbers. Do not forget the hood and screening cover. Check the primary side of the ignition coil for continuity (approx.  $0 \Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, H.T. ignition cables and spark plugs

Yes

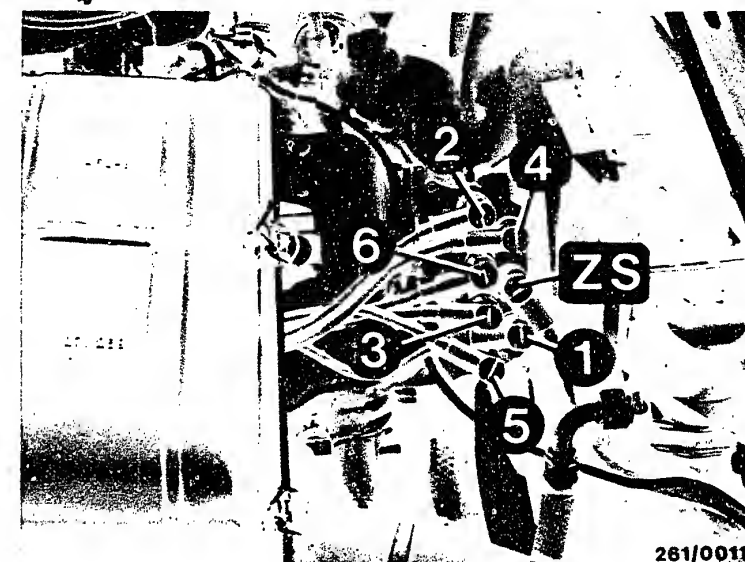
Air-flow sensor O.K.?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

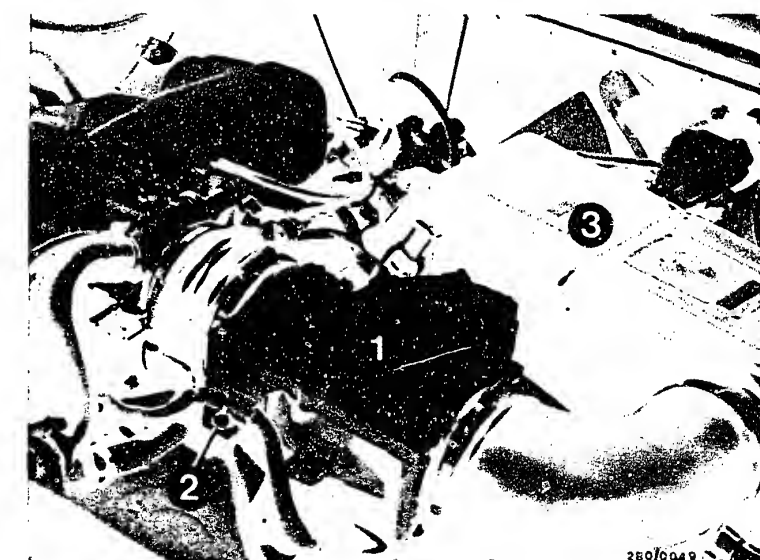
Yes

Continued on K17/K18



High-voltage distributor  
1 to 6 = Cylinder numbers  
ZS = High-tension cable to ignition coil

- 1 = Air-flow sensor
- 2 = Bypass screw
- 3 = Air filter



**K15**

CO adjustment

BMW 6 and 7 series



**K16**

CO adjustment

BMW 6 and 7 series





CO adjustment at idle too low or too high (continued)

Yes

Are all hose lines and electric leads securely attached?  
Visual examination.  
Is the air-intake system leak-tight?

No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.  
Checking for leaks: Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection.

Yes

Continued on K19/K20

**K17**

CO adjustment

BMW 6 and 7 series



**K18**

CO adjustment

BMW 6 and 7 series



CO adjustment at idle too low or too high (continued)

Yes

Start valve O.K.?  
(Leaks)

No

Testing the start valve for leaks:

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

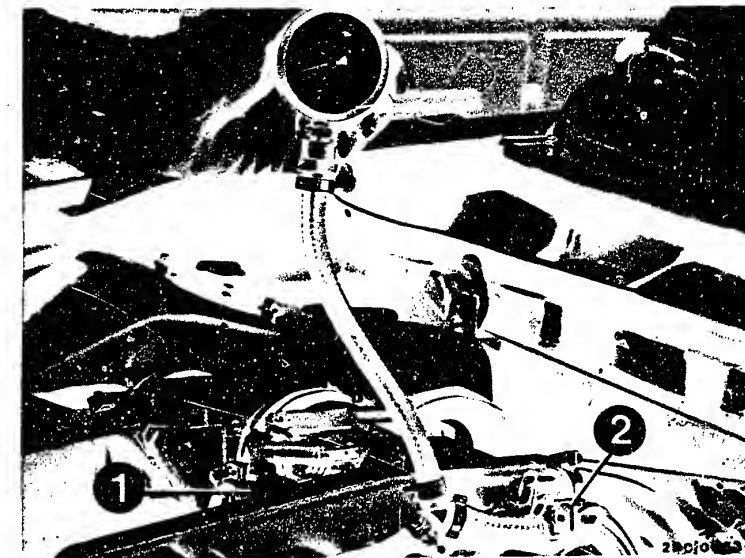
2. When removed:

Remove the start valve (caution! fire hazard!). Fuel line and electric lead remain connected. (Place collector vessel under the start valve). Build up the fuel pressure.

Test specification:.. Within one minute max. 1 drop may form at the mouth of the valve.

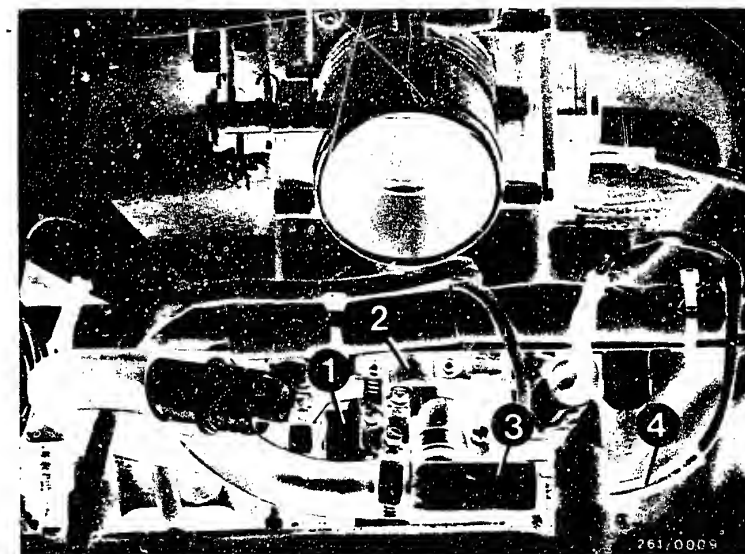
Yes

Continued on K21/K22



1 = Air hose to intake manifold  
2 = Start valve

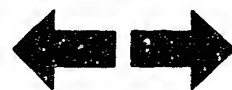
1 = Auxiliary-air device  
2 = Start valve  
3 = Idle-air adjusting screw  
4 = Electric connection of auxiliary-air device



**K19**

CO adjustment

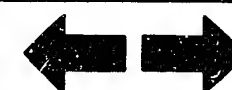
BMW 6 and 7 series



**K20**

CO adjustment

BMW 6 and 7 series



## CO adjustment at idle too low or too high (continued)

Yes

Exhaust-gas test with CO analyzer with engine at normal operating temperature.  
Set value:  
0.3...1.5 % by vol. CO

No

Requirement: Idle speed  
850...950 min<sup>-1</sup>.

- CO concentration too low:  
Turn bypass screw in air-flow sensor in stages in a clockwise direction (turn to the right).
- CO concentration too high:  
Turn bypass screw in air-flow sensor in stages in a counter-clockwise direction (turn to the left).

### Note:

Use new plug after finishing the adjustment.

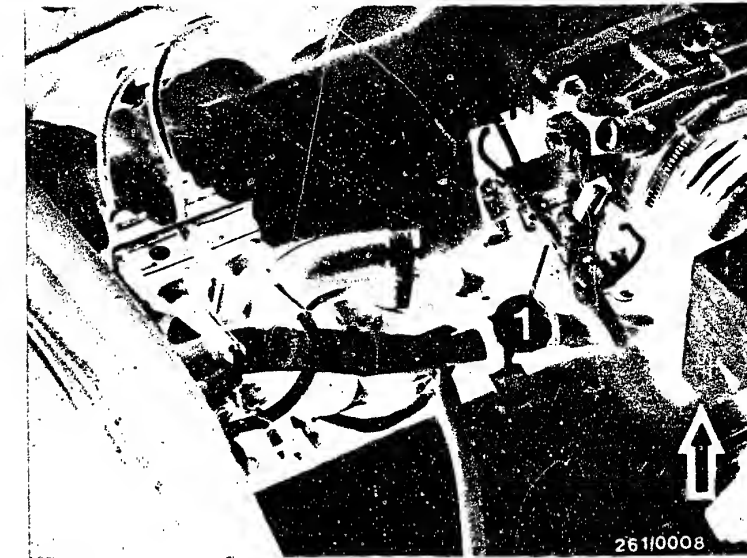
Yes

Testing completed for customer complaint  
"CO adjustment at idle too low or too high".  
Customer complaint remedied?

No

### Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3... B10). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



Arrow = CO adjusting screw  
1 = Idle-speed adjusting screw

**K21**

CO adjustment  
BMW 6 and 7 series



**K22**

CO adjustment  
BMW 6 and 7 series



## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

## CAR ALARM II, RETROFITTING

in vehicles equipped with Motronic

VDT-I-261/101 En

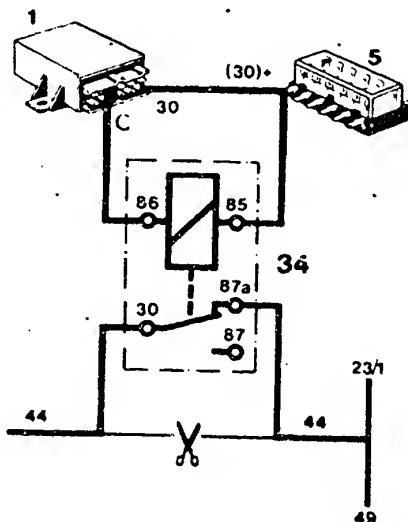
7.1981

Supersedes Ed. 9.1980

When fitting Car Alarm II (0 335 411 901) in vehicles with Motronic-equipped engines, terminal "I" of the ignition coil must not be connected to terminal "C" of the alarm relay. With the alarm system primed, terminal "C" of the alarm relay is connected internally to vehicle ground. The result is that attempts at starting the engine when the alarm system is primed lead to the destruction of the ignition coil and the current-regulated final stage in the Motronic control unit.

Remedy: Interruption of the supply voltage to the Motronic control unit by open-circuiting the ground connection (44) to the main relay with an additional relay 0 332 204 105. The Motronic control unit is thus put out of operation when the alarm system is primed.

The additional relay is switched by terminal "C" of the alarm relay (see wiring diagram).



- 1 = Alarm relay  
5 = Fuse box  
34 = Additional relay 0 332 204 105  
(change-over contact make-before break. In this case, normally closed contact relay)  
23/1 = Line to Motronic control unit  
44 = Line to Motronic main relay  
49 = Line to temperature sensor 2
- Section from the wiring diagram  
of the vehicle-related after-sales  
service instructions

Section from the wiring diagram  
of the vehicle-related after-sales  
service instructions

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L1

# Technical Bulletin

## BMW 6 and 7 series



# After-sales Service

## Technical Bulletin

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28

Changing of hose on electronically controlled fuel injection valves, manifold-pressure sensitive (EFI-D) and air-flow sensitive (EFI-L)

VDT-I-280/100 B  
Ed. 1 8.1975  
Translation of German  
edition of 4.7.1975

When injection valves with double sealing edges were introduced in February, 1974, the firms of Daimler-Benz, Saab and Volvo included the changing of the hose in their after-sales service program.

Instructions for changing the hoses for use in the Bosch after-sales service workshops have been produced.

Due to the different conditions to which vehicles are subject in service (to be specific the differences in temperature), there is a wide variation in aging of the hoses. For reasons of safety testing of the hoses must therefore be most carefully carried out. It is not possible to state the life of the fuel hoses for any vehicles, neither as a period of time nor according to the distance travelled.

As soon as the condition of the hoses becomes unsatisfactory, they must be replaced (e.g., when there are signs of cracking, embrittled or soft spots, etc.).

For satisfactory removal and fitting, tool 1 688 120 093 must be used.

For the different types of injection valve the following parts sets are supplied.

1. Parts set 1 287 010 700 for valves with crimped hose termination sleeve.
2. Parts set 1 287 010 701 for valves with short hose termination sleeve and double sealing edges.

### Instructions for fitting

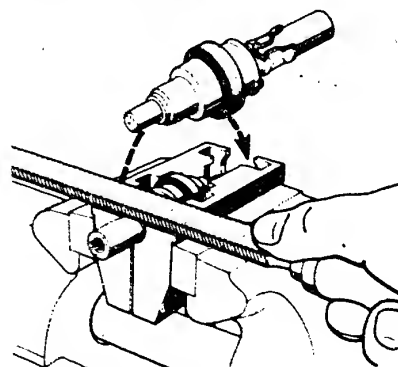
1. Parts set 1 287 010 700

### Removal of hose

1. It is not necessary to remove the fastening parts on the injection valve (rubber ring, gland)
2. Place injection valve in clamping fixture 1 688 120 093 and tighten up in vise.
3. File to open hose termination sleeve (use flat file, smooth narrow side against the valve).
4. Put the injection valve in the opposite side of the clamping fixture and tighten up in vise.
5. Cut to open the hose termination sleeve with side-cutting pliers and withdraw hose.



Connection made by crimped hose termination sleeve

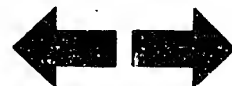


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GERMANY

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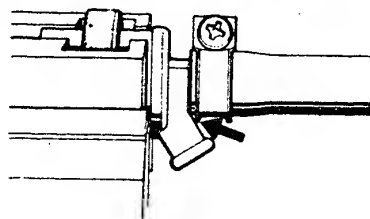
**L2**

Technical Bulletin  
BMW 6 and 7 series



#### Fitting of hose

1. Clean the outside of the tailpiece.
2. Push new hose onto tailpiece up to the stop.
3. Push on hose clamp up to the electrical connection and tighten up so that 2 mm of thread still remain visible in the centre.

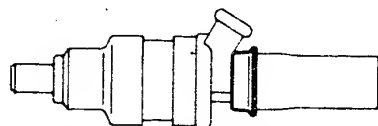


Attention. Do not tighten the hose clamp up to stop. Once hoses have been detached they must not be used again.

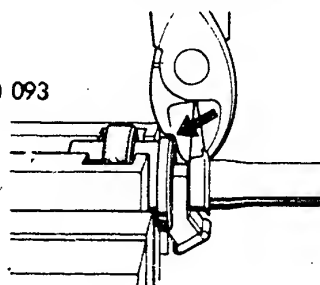
2. Parts set 1 287 010 701

#### Removal of hose

1. It is not necessary to remove the fastening parts on the injection valve (rubber ring, gland)
2. Place injection valve in clamping fixture 1 688 120 093 and tighten up in vise.
3. Cut to release hose termination sleeve with side-cutting pliers (modified) and remove.
4. Burn through the hose with a soldering gun or soldering iron in the longitudinal direction and remove.

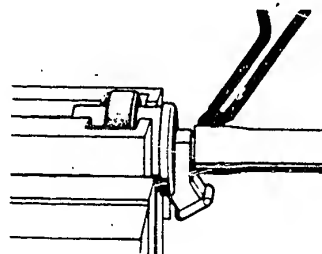


Connection made when valves with double sealing edges (short hose termination sleeve) are used

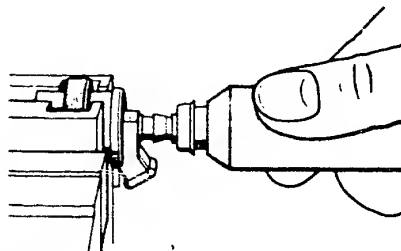


#### Fitting of hose

1. Clean the outside of the tailpiece.
2. Apply fuel or testing oil to the surface of the new fuel hose.
3. Press hose and hose termination sleeve by hand onto the tailpiece up to the stop using pressing tool 1 687 931 003. The hose termination sleeve must then be tight.



Attention. Do not use hose clamp on tailpiece of injection valve.



In case of inquiry, please contact your authorized representative.

ROBERT BOSCH GMBH  
Geschäftsbereich KH  
Kundendienstschule





# After-sales Service

## Technical Bulletin

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22

### Danger of Accident on Semi-conductor Ignition Systems

VDI-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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**L4**

Technical Bulletin

BMW 6 and 7 Series

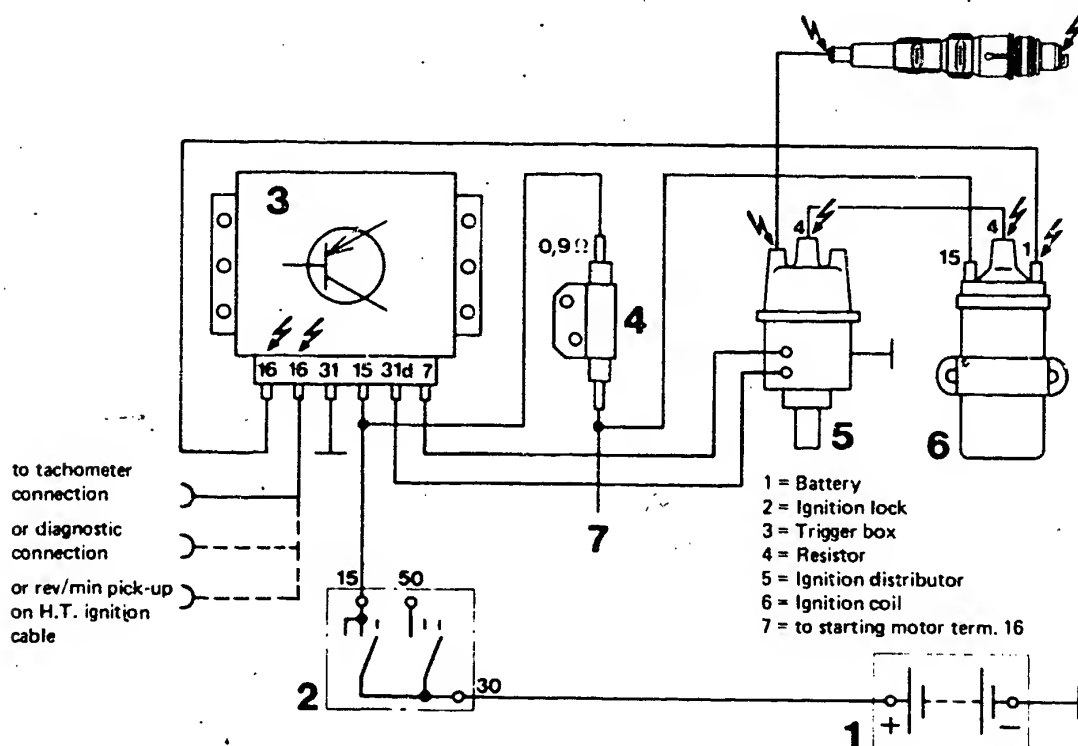


In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram

# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

BMW 633 CSi,

732 i

VDT-I-BMW 025 En

10.1979

with Motronic (digital engine electronics)

As from Sept. 1979, BMW are delivering the models 633 CSi and 732 i equipped with Motronic.

The engine is of the 6-cylinder type, with a swept volume of 3.3 l and an output of 147 kW (200 DIN PS). The ignition point can no longer be adjusted, it is programmed into the control unit.

### Equipment

In the Motronic system, the gasoline injection system and the ignition are combined in a digital engine control with a common control unit.

As regards function, the injection system corresponds to the L-Jetronic.

The ignition can be compared with a breakerless transistorized ignition system, but with the important innovation that an engine-specific ignition-point map is stored in the digital control unit. The adaptation of the ignition point depending upon speed and load by means of centrifugal and vacuum advance units, as is the case with conventional ignition systems, is carried out by means of the control unit (using the data from the ignition-point map stored in the microcomputer) in the Motronic. This operates together with inductive pulse generators for speed and reference point. High-voltage distribution is by means of the high-voltage distributor flanged onto the cylinder head, the distributor rotor being driven directly from the camshaft.

### Technical documentation

Technical bulletin "New Product"  
Trouble-shooting chart  
Equipment

VDT-I-261/2 En  
VDT-W-261/500  
on microfiche

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**L6**

Motor Vehicle Service Information

BMW 6 and 7 series



### Service plans

In order to provide an after-sales service coverage, we will concentrate during the first stage (in the Federal Republic of Germany) on repairs being carried out by selected Bosch Service Stations in all the larger cities.

Outside Germany, in Europe, this task will for the beginning be taken over by the REGE/AV Service Stations.

As the MOTRONIC becomes more and more widespread, we will continuously expand the after-sales service network.

In order to be able to carry out repairs, it is necessary that a member of the workshop staff attend schooling at KH/VSK and that a DME testing adapter is purchased (0 684 101 800).



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party

BMW 635 CSi, 735 CSi,  
633 CSi, 733 i

VDT-I-BMW 032 En  
10.1980

### Motronic control unit with PC-board switch

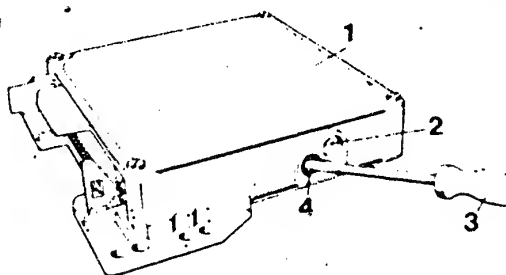
As from August 1980, the control units 0 261 200 002 for the 635 CSi and 735 i, the 0 261 200 004 for Sweden and Australia and later-models a PC-board switch which is accessible from outside the unit (Fig. 1).

The introduction of this switch means that workshop personnel have the possibility of changing the ignition point and are also provided with an additional mixture adaptation facility. The values for mixture and ignition correction/adaptation are held within relatively tight limits. They were selected in order that with this PC-board switch in any position, damage cannot normally occur to the engine provided that the prescribed gasoline/petrol is used.

Unnecessary adjustment to the switch though, leads to poor driveability, and particularly to "search" during overrun and increased fuel consumption.

Fig. 1

- 1 = Control unit
- 2 = Diode
- 3 = Screwdriver
- 4 = PC-board switch cap



### Ignition-point correction

The quality of the gasoline on sale in a variety of countries does not always comply with the standard required for this engine. It is therefore recommended that for journeys in countries where the premium gasoline (super-grade petrol) octane number (research method) is below 98 a correction is carried out to the ignition point by means of the PC-board switch. At the moment, this applies to the following countries:

Bulgaria, Czechoslovakia, DDR, Greece, Hungary, Poland, Rumania, Spain and Turkey.

The correction of the ignition point by 4.5° crankshaft in the "retard" direction applies across the whole of the ignition-point map and prevents the "ping" and "knock" which are dangerous for the engine.

The adjustment of the ignition point leads, inevitably, to an increase in fuel consumption.

For this reason, as soon as the journey has been completed for which such an adjustment was carried out, the original setting must be adjusted again.

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**L8**

Motor Vehicle Service Information

BMW 6 and 7 series



### Mixture adjustment

As is already known, the CO-adjustment takes place through the idle-mixture screw in the air-flow sensor. This is still the case and no change has taken place here. The PC-board switch though, apart from changing the ignition point also provides an additional possibility of adjusting the mixture. The PC-board switch is operative over the complete range as opposed to the bypass in the air-flow sensor which is only effective at idle and lower part-load range. For this reason, a change in the mixture using this switch is only justified when it is absolutely certain that defects are not present on the engine (i.e. valves, intake system, exhaust), the fuel-injection system or the ignition.

The Motronic is checked using the after-sales service instructions which have already been issued.

Further details can be taken from the Table on the last page of this Service Information.

### Special adjustment pin KDMT 0001 for the PC-board switch (Fig.2)

Bosch has developed a special tool to facilitate the professional adjustment of the PC-board switch. The tool is of plastic material and, in order to prevent damage to the valuable control unit when the switch is forced up against the stop, the triangular end breaks off when too much force is used.

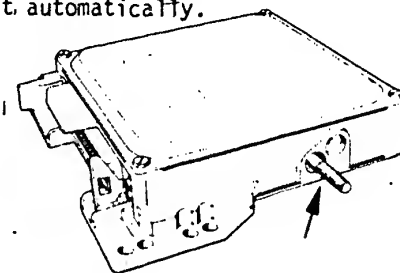
NEVER use a screwdriver to adjust the PC-board switch.

The special tool KDMT 0001 is available through the usual channels or directly from KH/VKD 4.

Subscribers to the tool program receive it automatically.

Fig. 2

Adjustment pin KDMT 0001  
fitted in control unit (arrow)



### Adjusting the PC-board switch

Remove the control unit (see After-sales service instructions)

Using a screwdriver, carefully remove the cap (Fig. 1)

In order to do this, insert a wide-bladed screwdriver into the cap at an angle (Fig. 1). Carefully push through the cap and remove it. Take care that the PC-board is not knocked or otherwise contacted in the process.

The hole (triangular polygon) is now free for insertion of the special tool KDMT 0001.

Due to the danger of destroying or damaging the control unit metallic objects or screwdrivers are NOT to be used





Using a minimum of force, turn the PC-board switch to its left-hand stop (Fig. 3). If already adjusted, count the number of "click" positions and note them down.

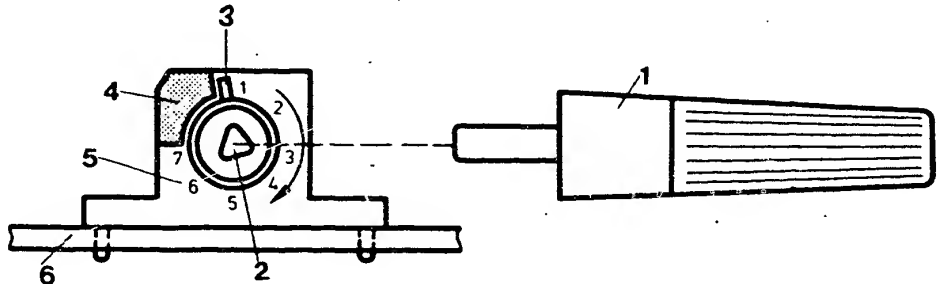
Select the new switch position according to the following Table.

Count the number of "click" positions starting from the left-hand stop.

Take into account the fact that the switch has defined detent positions and intermediate positions are not possible.

Check that the setting is correct by using the CO-analyzer and taking the vehicle on a test run.

Fig. 3



After the adjustment has been completed, a new cap (red) MUST be fitted in the hole in the control unit. This is important because it guarantees protection against humidity and prevents unauthorized tampering.

Part number for red cap : 1 280 508 012

Note: Black and blue caps are only fitted by either Bosch or BMW at the works.

Fig. 3

- 1 = Adjustment pin KDMT 0001
- 2 = Bore (triangular polygon)
- 3 = Basic setting (left-hand stop)
- 4 = End stop
- 5 = Switch positions ("click" or detent positions)
- 6 = PC board



# PC-board switch positions and their range of application

Switch pos'n	Range of adjustment for mixture (CO)	Ignition-point correction	Range of application
Left-hand stop	Basic setting = works setting		Driveability OK CO - OK or corrected by means of the idle-mixture screw in the air-flow sensor
Pos'n 1	Richer by +4% (injection duration is increased by 4%, based upon 1% CO, the CO figure climbs to approx. 2 to 2.5%)	0 (unchanged)	Cause of complaint: Shake or "search", CO cannot be sufficiently adjusted using idle -mixture screw in a-f sensor. First check: valve setting, idle contact, unmetered air. Increased fuel consumption can occur upon adjustment.
Pos'n 2	Leaner by -4% (injection duration is decreased by 4%)	0	Cause of complaint: Excessive fuel consumption, mixture too rich, mixture adjustment not possible with idle-mixture screw in a-f sensor. Try setting idle CO using idle-mixture screw again after setting switch to 2 or 3. If shaking or "search" occur, setting is unsuitable.
Pos'n 3	Leaner by -6% (duration of injection reduced by 6%)	0	
Pos'n 4	0 (as basic setting)	-4.50 crankshaft (in retard direction)	For countries in which the octane number (research method) is below 98. Increased fuel consumption can occur upon adjustment.
Pos'n 5	Richer by +4% (as switch position 1)	-4.50 crankshaft (in retard direction)	For countries in which the octane number (research method) is below 98, and when a PC-board switch correction has already been carried out to pos'n 1, 2 or 3. Example: If a vehicle comes into the workshop and is to be adjusted to lower quality fuel, then switch pos'n 6 is to be selected.
Pos'n 6	Leaner by -4% (as switch position 2)	-4.50 crankshaft (in retard direction)	
Pos'n 7	Leaner by -6% (as switch position 3)	-4.5% crankshaft (in retard direction)	Also to be noted when turning back the switch: Increased fuel consumption can be the result.



## Table of Contents

When direct trouble-shooting a specific Motronic component it is absolutely essential to look up the respective component under the corresponding customer complaint.

<u>Section</u>	<u>Coordinates</u>
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1. Test specifications.....	A 2 - A 4
2. Electrical terminal diagram.....	A 5 - A 8
3. Diagram of electric lines.....	A 9 - A 12
4. Installation position of components.....	A 13 - A 14
5. Diagram of fuel lines.....	A 15 - A 16
6. Test equipment and tools.....	A 17 - A 18
7. General information.....	A 19 - A 22
8. Trouble-shooting.....	B 1 - B 10
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8.2 Direct trouble-shooting.....	B 5 - B 10
9. Test with Motronic test adapter.....	B 11 - F 17



## 10. Trouble-shooting program according to customer complaints

### Customer complaint:

Starting motor operates, engine fails to start or starts only with great

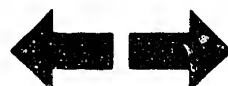
<u>difficulty.....</u>	F 18 - G 10
Secondary patterns.....	F 20
Injection valves.....	F 20
Thermo-time switch.....	F 20
Start valve.....	F 22 - G 1
Auxiliary-air device.....	G 3 - G 6
Air-flow sensor.....	G 7
Hose lines, electric lead connections and leak test.....	G 7 - G 10

### Customer complaint:

<u>Engine starts but then dies.....</u>	G 11 - G 24
Hose lines, electric lead connections and leak test.....	G 13
Thermo-time switch.....	G 15
Start valve.....	G 17 - G 20
Air-flow sensor.....	G 19
Auxiliary-air device.....	G 21 - G 24

### Customer complaint:

<u>Uneven engine idle.....</u>	H 1 - H 14
Secondary patterns.....	H 3
Air-flow sensor.....	H 3
Hose lines, electric lead connections and leak test.....	H 5
Auxiliary-air device.....	H 7 - H 10
Start valve.....	H 11
Injection valve.....	H 13
Engine-speed and CO adjustment.....	H 13



Customer complaint:

<u>Poor throttle take-up</u> .....	H 15 - H 24
<u>Secondary patterns</u> .....	H 17
<u>Air-flow sensor</u> .....	H 19
<u>Hose lines, electric lead connections and leak test</u> .....	H 19
<u>Auxiliary-air device</u> .....	H 21 - H 24

Customer complaint:

<u>Engine missing under all operating conditions</u> .....	J 1 - J 12
<u>Secondary patterns</u> .....	J 3
<u>Plug-in connections</u> .....	J 3
<u>Start valve</u> .....	J 5
<u>Fuel delivery</u> .....	J 7
<u>Control unit</u> .....	J 7
<u>Air-flow sensor</u> .....	J 9
<u>Generator</u> .....	J 11
<u>Interference-suppression devices</u> .....	J 11
<u>Spark-plug connectors</u> .....	J 11

Customer complaint:

<u>Fuel consumption too high</u> .....	J 13 - J 18
<u>Secondary patterns</u> .....	J 15
<u>Start valve</u> .....	J 15
<u>Air-flow sensor</u> .....	J 17



Customer complaint:

No maximum engine power/top speed

not reached.....K 1 - K 12

Secondary patterns.....K 3

Throttle-valve adjustment.....K 3

Fuel pressure at full load.....K 5

Air-flow sensor.....K 7

Air intake.....K 7

Fuel delivery.....K 9

Hose lines, electric lead connections  
and leak test.....K 11

Customer complaint:

CO adjustment at idle too low or

too high.....K 13 - K 22

Secondary patterns.....K 15

Air-flow sensor.....K 15

Hose lines, electric lead connections  
and leak test.....K 17

Start valve.....K 19

Exhaust-gas adjustment.....K 21

Technical Bulletins and  
Service Information sheets.....L 1 - L 11

